
SERVICEMAN'S GUIDE

for

FARMALL 



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(INCORPORATED)
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INTRODUCTION

Service is sold the same as any other commodity and the purchaser is entitled to receiving a fair value for his money. To give the purchaser the service on his tractor to which he is entitled by a dealer displaying the McCormick-Deering International Service Sign, this dealer's servicemen should be both competent mechanics and be well informed on McCormick-Deering tractors and machines.

Experience develops competent mechanics, but to know your machines takes study and a ready reference file.

The Serviceman's Guide for the Farmall "M" gives information essential for the repair of this new tractor and is so laid out that it will serve as a ready source of reference.

Service specifications are listed for both the engine and chassis. In addition service charts show the relation of parts to each other with just enough text giving factory tolerances and giving brief instructions for disassembling and assembling the tractor.

The Farmall "M" is a new tractor in every detail which will require that servicemen make a thorough study of its construction and the operation of component parts of the various assemblies that constitute this tractor so they will be able to properly disassemble and reassemble these units. It is only with a thorough understanding of the working parts and their relation, one to the other, that the quality of McCormick-Deering Service can be upheld.

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Farmall Model "M" Tractor

Model Farmall "M" Engine Specifications—Continued

Bearing running { Diameter, .001 to .0035"
clearance . . . { End, .003 to .011"
End thrust taken on plate at front of
crankcase between drive gear and bearing.
Bearings reamed to size for repairs. Not
necessary to ream bearings after assembly.

CONNECTING RODS:

Bearing . . . Precision. Material, bab-
bitt-steel back

Bearing journal { Regular, 2.4975 to 2.4985"
diameter . . . { .030 Undersize, 2.4675 to
2.4685"

Bearing length. . . . { Effective, 1-11/16"
Total, 1-23/32"

Running clearance. { Diameter, .002 to .003"
Side, .008 to .012"

Connecting rod . . . Center to center, 10"
Cap of connecting rod is set at a 45 de-
gree angle with rod to permit removal
from top of block. Cap attached to rod
with two special type cap screws which
are under cut back of the threads. Should
too much tension be applied the cap screw
will give way in the under cut section
instead of in the threads making it pos-
sible to readily remove threaded end.

Connecting rod cap screw . . . Size 7/16"
special, tension 650 in. lb. or 54 ft. lb.

COOLING SYSTEM:

Type . . . Enclosed system, water pump
circulation; thermostat with a bypass
which allows water to circulate through
the engine only, till thermostat opens.

Radiator . . . I.H.C. flat tube type

Fan . . . 18" diameter, 4 blades

Ratio of fan to engine speed . . . 1.4 to 1
Fan and water pump drive, Vee belt adjust-
ed by turning one flange of water pump
drive pulley.

Capacity, U. S. Gallons . . . 6

Thermostat . . . opens at 165°F., wide open
at 195°F.

CRANKSHAFT:

Bearings . . . 3 precision babbitt lined,
steel back

Bearing journal { Regular, 2.747 to 2.748"
diameter. . . . { Undersize, 2.717 to 2.718"

Bearing length { Effective, front and rear,
1-17/32"; center, 1-27/32"
Total, front and rear,
1-9/16"; center, 2.243-
2.245"

Running { Diameter, .002 to .003"
clearance { End, .004 to .008"

End thrust taken on center bearing.

Crankshaft bearing bolts . . . Size 9/16",
tension 1200 in. lb. or 100 ft. lb.

FUEL SYSTEM:

Fuel tank capacity, { Main tank, 22
U. S. Gal. { Starting tank, 1
Fuel feed to carburetor . . . Gravity
Carburetor . . . I.H.C. updraft, size 1-1/4"
Carburetor adjustment . . . Low and high
speed fuel adjusting screws.
Carburetor float level . . . Refer to il-
lustration 23.

LUBRICATION:

Type . . . Force feed with gear type cir-
culating oil pump supplying pressure
lubrication to crankshaft bearings, con-
necting rod bearings, valve mechanism, and
timing gears and governor. Piston and
piston pin lubricated by splash.

Oil filter . . . Partial flow with a star-
shape paper element which should be re-
moved whenever the oil is changed.

Lubrication general . . . Lincoln Zerk
fittings. Refer to instruction book.

Oil pressure . . . Valve in oil pump hous-
ing set to open at 55 to 60 lb. per sq.
in.

Oil pressure { Free length, 3-19/32
regulating { Should test, 38 lb. at 2-3/32"
spring. . . .

Oil capacity, U. S. qt. . . . 7

PISTONS:

Type and material . . . Trunk type, grey
iron

Clearance in sleeve . . . Select fit to
give .004 to .005 normal measured clear-
ance. A 1/2" wide (.0035") ribbon gauge
should have a light pull of 4 to 6 lb.
tension . . . "GO" gauge. A .0045" ribbon
should have a tight pull of 11 to 14 lb.
tension . . . "NO-GO" gauge.

PISTON RINGS:

Number . . . 3 compression, 1 oil control
all above pin. Third compression is
slightly tapered so should have the word
"top" assembled toward top of piston.

Width . . . 1st compression, 1/8"; 2nd
and 3rd compression, 5/32; oil control,
1/4".

Ring gap - .010 to .020"

Clearance in { 1st compression, .004"
groove. . . . { 2nd and 3rd compression
and oil control, .003"

PISTON PIN:

Type . . . Hollow, full-floating. Held in
place with snap ring retainers, which fit
into grooves at each side of piston.

MEMORANDUM

Farmall Model "M" Tractor

A new large size Farmall, the Model "M" has been added to the McCormick-Deering line of tractors. It is being manufactured at Farmall Works, Rock Island, Illinois.

When the Farmall "M" is equipped with pneumatic tires five forward speeds are at the command of the operator - four working speeds and one road speed. When equipped with steel wheels the fifth speed is blocked out. Speeds when equipped with 9.00 x 36 tires are 2-1/2, 3-1/4, 4, 4-7/8 and 15-7/16 M.P.H. Reverse 3 M.P.H. This assortment of speeds together with the variable speed governor makes it possible to select the most economical engine speed for the work to be done.

The rear wheel treads are adjustable to any tread from 52 to 88 inches. This is accomplished by jacking up the rear of the tractor, loosening the four bolts which lock the wheels to the axle, slide the wheels to the desired position and retighten bolts. If still wider treads are desired it is possible to secure longer axles giving treads up to 96".

The power plant is a 4-cylinder $3\frac{7}{8} \times 5\frac{1}{4}$ " bore and stroke, valve in head engine governed at 1450 R.P.M. Engines are regular equipped with a combination manifold, radiator shutter and compression ratio to burn either distillate or kerosene as fuel.

Engine design features are: Removable dry-liner cylinder sleeves, replaceable precision bearings, force-feed lubrication to all parts except piston pin and piston which are lubricated by splash, and an oil filter with replaceable element. The crankcase, governor housing and valve housing are ventilated to hold condensation to a minimum. A variable speed governor is regular equipment and is built into one

unit which attaches to the side of the crankcase. Engine is designed to mount with four point suspension in tractor frame with rubber front mounting.

Ease of operation and operator's comfort have been given special consideration. The seat is a large implement type cushioned with sponge rubber and covered with water proof duck. It is spring mounted and may be tilted up providing room for the operator to stand should he so desire. All controls, gear shift, governor control lever, radiator shutter crank, magneto grounding switch, power take-off control, clutch pedal and brake pedals are all within easy reach of the operator.

Special attention has been given to the appearance of the Farmall "M". Its ruggedness and strength has been given a sleek and modern appearance with no sacrifice in accessibility. The radiator grille can easily be removed by applying a screw driver to four special screws giving them a quarter turn which loosens them. The screws are locked with a spring assuring a tight fit at all times, thereby eliminating the possibility of rattles. In addition the screws are locked in the radiator grille to prevent the possibility of them becoming lost when the grille is removed. The engine cover or hood is held in place with four spring latches.

Differential and transmission are assembled into one housing which is connected to the engine by the clutch housing. Radiator and front of engine are carried on two channel irons which bolt to the front bolster.

The chassis and engine serial numbers start at No. FBK-501 and up.

Model Farmall "M" Engine Specifications

GENERAL:

Cylinders, number and type . . . 4 Renewable dry-liner sleeves, grey iron.
Bore and stroke . . . 3-7/8 x 5-1/4
Piston displacement per revolution, cu. in. . . . 247.65
Compression ratio (distillate or kerosene) . . . 4.5 to 1
Fuel . . . Distillate or kerosene
Piston speed, feet per minute at 1450 R.P.M. . . . 1268.8
Governed engine speed R.P.M. . . . 1450

Governed fast idle speed R.P.M. . . . 1595
Governed low idle speed R.P.M. . . . 950
Minimum idle speed R.P.M. . . . 425

CAMSHAFT:

Bearings . . . Three, babbitt lined steel back
Bearing journal diameter, inches . . . 1st, 2.243 to 2.244"; center, 2.118 to 2.119"; rear, 1.868 to 1.869"
Bearing length, inches . . . 1st, 1-7/16"; center, 1-15/32"; rear, 1-1/16"

Farmall Model "M" Tractor

Model Farmall "M" Engine Specifications—Continued

Dimensions . . . {Length, 3-1/4"
Diameter, 1.3125 to 1.3128"
Fit in rod . . . Select fit with .0007"
clearance
Fit in piston . . . Select fit with .0005"
clearance
Tools . . . Reamer body SE-948, Blades
SE-948-3, Pilot Bushing SE-948-12, Hone
Blades SE-948-7

VALVES:

Location . . . In cylinder head with re-
placeable guides.

Head diameter {Exhaust, 1-21/32"
Intake, 1-13/16"

Stem diameter371" to .372"

Stem clearance in guide002 to .004"

Tappet clearance, engine hot017"

Lift . . . 7/16"

Seat angle . . . 45°

Seat width087" to .097" (3/32")

Seat insert . . . Grey iron insert in ex-
haust valve seat only. Assembly "M" up.

Valve timing . . . {Intake opens 5° after
TDC, closes 41° after
BDC
Exhaust opens 42° be-
fore BDC, closes 10°
after TDC

Valve material {Exhaust, Silchrome "XB"
Intake, M.D. 3140 steel forging

Spring tension. . {Free Length, 2-7/8"
Should test 58.9 lb. at
1-25/32" valve closed.

Valve lever shaft diameter748 to
.749"

Valve lever clearance in bushing002
to .004"

CYLINDER HEAD STUDS:

Stud size . . . 1/2 in.

Stud nut tension . . . 750 in. lbs., 62.5
ft. lbs.

Tighten nuts from center of head outward.

First tighten all nuts when engine is
cold, then thoroughly warm up engine and
retighten.

GOVERNOR:

Type . . . Centrifugal variable speed, ad-
justable from tractor seat. Engine under

governor control from 950 to 1450 R.P.M.
Unit construction. Refer to page 14 for
service information.

IGNITION:

Type . . . I.H.C. Model H-4 magneto with au-
tomatic impulse coupling, flanged mounted.

Firing order . . . 1, 3, 4, 2

Spark plugs . . . Heavy-duty, size 18 mm.,
gap .020-.025"

Magneto fixed spark . . . No advance or
retard.

MANIFOLD

Type . . . Adjustable heat control, con-
trolling exhaust gases which circulate
around portion of intake manifold.

CLUTCH:

Type . . . Single plate, dry disc, spring
loaded, foot operated.

Size and make . . . 11-inch, Rockford

Springs . . . {Number used, 9
Test 180-190 lbs. when
compressed to 1-13/16"

Torque capacity . . . 310 ft. lbs.

Throwout bearing . . . Ball thrust

Pilot bearing . . . Ball

Adjustments . . . Clutch fingers are ad-
justable externally through hole in bot-
tom of clutch housing.

TORQUE TIGHTNESS SPECIFICATIONS (BOLT TENSIONS)

LOCATION	Size	Foot Lbs.	Inch Lbs.
Crankshaft bearing bolt	9/16"	100	1200
Connecting rod bolt .	7/16" Special	54	650
Cylinder head stud. .	1/2"	75	900

Tension indicating wrench SE-1137 avail-
able.

Farmall Model "M" Tractor

Chassis Specifications

FRONT WHEELS: Double cast iron wheels with skid rings. Diameter $22\frac{1}{2}$ " ; face 4". Cast iron wheels available for pneumatic tires. Wheels revolve on two tapered roller bearings which are adjustable. Bearings are sealed by a labyrinth, felt and leather seal. Leather seal assembled on front axle with lip toward center of tractor.

Tread with steel wheels $9\text{--}1\frac{1}{8}$ " ; with pneumatic tire $8\frac{1}{2}$ ". Single front wheel and adjustable tread front axle available as special equipment.

REAR WHEELS: steel built up wheels with spade lugs. Cast iron wheels for pneumatic tires can be secured. Wheels have a split hub and are keyed to the axle. Adjustable on rear axle and reversible for any tread from 52 to 88".

AXLES:

FRONT: Assembled into lower bolster mounts two wheels and turns as a unit.

REAR: Individual shafts on each side of tractor mounted in removeable carriers on ball bearings and sealed by a felt and leather seal with lip turned out. Seals located in bearing retainer and can be replaced after removing wheel and bearing retainer. Final drive gear, spline mounted to inside end of axle.

DIFFERENTIAL: Four pinion open type with a two piece case and mounted on two ball bearings. Bevel gear secured to differential case with bolts.

DIFFERENTIAL SHAFT OR COUNTERSHAFT: Two shafts integral with the final drive pinion, one end splined which fits in side

gear of differential and other end carries brake drum. Shafts mounted on two ball bearings both contained within same removeable cage. Shafts sealed with a double leather seal with lips turned in. Seals fit on hub of brake drum and can be readily replaced after removal of brake drum.

BRAKES: External contracting bands on cast steel drums. Drums are located on end of differential shafts. Brakes are operated by two foot pedals and may be applied independently or together by locking the pedals. Brake facing width 2", dia. $11\frac{1}{2}$ " ; area 65 sq. in.

TRANSMISSION: Selective sliding spur gear type with five speeds forward and one reverse. Five speeds for pneumatic tires only and fifth speed is locked out when tractor is equipped with steel wheels. Gears are mounted on two shafts except for reverse gear which is mounted on a separate shaft. Shafts are parallel with center line of tractor. Transmission main shaft carries the sliding gears for shifting gears and the bevel pinion. It is mounted on a ball bearing and a roller bearing. The ball bearing is next to the bevel pinion and takes the end thrust of the bevel pinion. The roller bearing is located within the drive gear and shaft. The countershaft is mounted on two ball bearings. Reverse gear has two bushings and revolves on a stationary shaft. The drive for the power take-off is taken from rear end of countershaft. The drive for the hydraulic power lift is taken from the front end of the countershaft. Belt pulley is located on top of transmission and is driven from drive gear assembly.

Oil capacity 14 gallons.

	TRAVELING SPEEDS - MILES PER HOUR					
GEAR	Steel Wheels - 51" dia.		Pneumatic Tires			GEAR RATIO
	Rim Speed	Actual Speed	9.00 x 36 - 26.4 R.R.	10.00 x 36 26.6 R.R.	11.25 x 36 27.7 R.R.	
1st	2.381 (2-3/8)	2.62 (2-5/8)	2.47 (2-1/2)	2.48 (2-1/2)	2.59 (2-9/16)	92.397
2nd	3.171 (3-3/16)	3.48 (3-1/2)	3.28 (2-1/4)	3.31 (3-5/16)	3.44 (3-7/16)	69.389
3rd	3.88 (3-7/8)	4.26 (4-1/4)	4.01 (4)	4.04 (4)	4.21 (4-7/32)	56.779
4th	4.70 (11/16)	5.16 (5-1/8)	4.87 (4-7/8)	4.91 (4-15/16)	5.11 (5-1/8)	46.778
*5th	14.89 (14-7/8)	16.35 (16-3/8)	15.41 (15-7/16)	15.53 (15-1/2)	16.17 (16-3/16)	14.777
Rev.	2.88 (2-7/8)	3.17 (3-3/16)	2.98 (3)	3.01 (3)	3.13 (3-1/8)	76.328

* 5th gear locked out when tractor is equipped with steel wheels.
Actual speeds based on 4" lugs penetrating $37\frac{1}{2}\%$.

Farmall Model "M" Tractor

Chassis Specifications—Continued

STEERING GEAR: Worm and sector type; steering worm is mounted on a bronze bushing and a ball bearing. Bushing sealed with a leather seal.

Steering sector, spline mounted to steering shaft. Steering worm sector runs in an oil bath - capacity 1 quart.

Steering shaft mounted at both ends with bushings, thrust is taken by a ball bearing. Spring loaded leather seal, with lip turned up, at bottom of top bushing and a felt seal at top of bottom bushing and thrust bearing. Composition 18" dia. steering wheel.

CONTROLS: Governor control, magneto grounding switch and radiator shutter crank are located within easy reach of the operator. Throttle is controlled by hand lever operating variable speed governor.

FUEL TANK: Two piece seam welded construction. Fuel tank capacity 22 gal. Starting tank 1 gal.

AIR CLEANER: Donaldson 6 inch dia. oil washed screen type. Straining screens are continually being washed with oil that is agitated by the incoming air. Dust removed from air is deposited in a receptacle removable for cleaning.

SEAT: Large comfortable implement type upholstered with sponge rubber and covered with waterproof duck. Seat assembly on a channel support which is mounted on a coil spring. Seat can be tipped to the rear providing room for the operator to stand. It is adjustable forward and backward.

DRAWBAR: Quick detachable type, vertical positions adjustable at 10-5/16, 11-7/8, 13-5/16, 14-13/16 and 16-5/16 above ground level. Lateral hitch position extends to 13" on either side of center hole.

WEIGHT OF TRACTOR: Approximate shipping weight: with steel wheels, 3495 lbs.; with pneumatic tires, 3950 lbs. Includes lubricants but no fuel, water or attachments.

DIMENSIONS GENERAL:

Turning radius (brake applied with rear tread of 52")	101½"
Length, overall	126¾"
Width, maximum (to outside edge of rear wheels)	96"

Width, minimum (to outside edge of rear axles)	84½"
Height to top of steering wheel	76"
Wheelbase	90"
Tread, front (fixed)	9-1/8"
Tread, rear (variable)	52" to 88"
Clearance under rear axle	23¼"
Clearance under rear frame	15-5/8"

FRAME: The rear section including the transmission differential and final drive gears is cast iron. The universal and clutch housing is of cast iron and is secured to transmission case with cap screws and dowel bolts. The engine flywheel housing is bolted to clutch housing. Front end of engine is carried on two channel irons which bolt to the front bolster. The bolting together of all parts mentioned makes a rigid frame construction.

HORSE POWER:

Belt operating maximum	33.1 H.P.
Rated belt H.P. (85% Max.)	28.14 H.P.
Drawbar operating maximum	28.2 H.P.
Rated drawbar (75% max.)	21.2 H.P.

NOTE: These figures are only approximate. More definite values will be available after tractor has been officially tested.

CAPACITY OF FUEL TANKS, COOLING SYSTEM AND LUBRICATING SYSTEM:

Fuel tank, U. S. Gallons	22
Starting tank, U. S. Gallons	1
Transmission case and final drive compartment, U. S. gallons	14
Crankcase, U. S. quarts	7
Cooling system, U. S. Gallons	6
Steering gear compartment, U.S. quarts	1

BELT PULLEY: Furnished as special equipment and driven from transmission drive gear. Belt pulley R.P.M., 898.57. Pulley face, 7½". Pulley diameter, 11" Belt speed, 2587.7.

POWER TAKE-OFF: Furnished as special equipment. Drives from rear of countershaft. Power Take-off R.P.M. 537; splines 6, size 1-3/8". Length 3".

CLUTCH: Rockford 11" single plate dry disc spring loaded type. Nine pressure springs. Ball thrust throwout bearing. Ball bearing for clutch shaft. Release fingers adjustable externally by screws which can be reached through bottom of housing.

Farmall Model "M" Tractor

SPECIAL EQUIPMENT - MODEL M

Name	Order No.
Swinging Drawbar	49204-D
Power Take-Off (Speed 537 R.P.M. - See page 24 for dimensions)	49267-DA
Cultivator Shifter Lever	49194-D
Exhaust Muffler.	45804-DA
Starting Equipment	52037-D
Lighting (Electric battery type - 2 head lamps).	52038-D
Starting and Lighting (2 head lamps)	51722-D
Lights (electric) for tractors equipped with starter	54632-D
Starter for tractors equipped with lights.	54633-D
Rear Wheel Weight - First Weight (140 lb. each) (This weight must be applied first).	49329-D
Rear Wheel Weight - Second Weight (140 lb. each)	49330-D
*Rear Wheel Weight - Third Weight (140 lb. each)	49331-D

* Third weight consists of a set of two weights 6818-D only (No bolts). To apply third weight, it is necessary to take two of the bolts which hold the second weight to the first weight and use them for attaching third weight to second weight.

Belt Pulley (Pulley 11" dia. x 7½" face. Pulley speed 899 R.P.M. giving belt speed of 2,587 ft. per min.).	49265-D
Single Front Wheel Pneumatic Tire-IHC Grey Iron Wheels.	
49197-DA Wheel with rim for 7.50 x 16 tire (less tire)	
49199-DA Wheel with rim for 9.00 x 10 tire (less tire)	
Rear Wheel Extension Tire (6" Wide).	49236-DA
Pneumatic Tire IHC Grey Iron Front Wheels with Rims for 6.50 x 16 tires but less tires (Two required per Tractor).	49228-D
Pneumatic Tire Type IHC Rear Wheels Less Tires & Tubes. Following numbers cover one complete wheel. Two are required to equip a tractor.	

Part No.	Name	Rim Size	Type of Rim
45829-DA	Rear Wheel	8.00 x 36	Goodyear "LTD" - 2 piece
45830-DA	Rear Wheel	8.00T x 36	Firestone "RIT" - 3 piece
53930-D	Rear Wheel	6.00 x 36	Goodyear, Firestone or Cleveland Welding Co. - 1 piece rim with drives

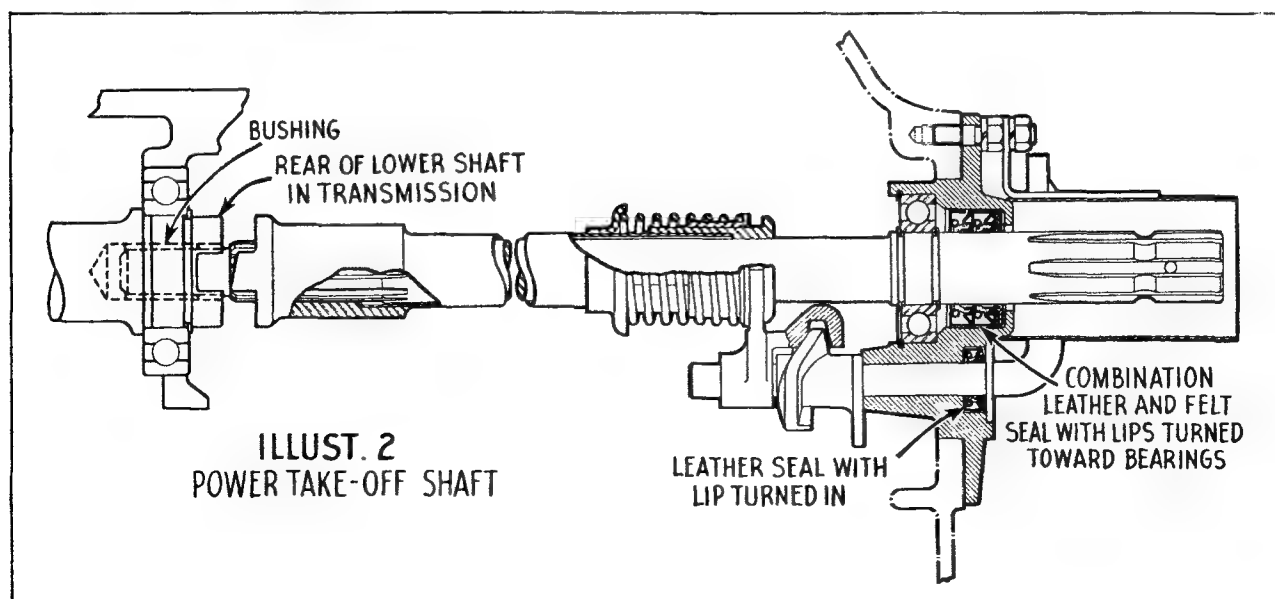
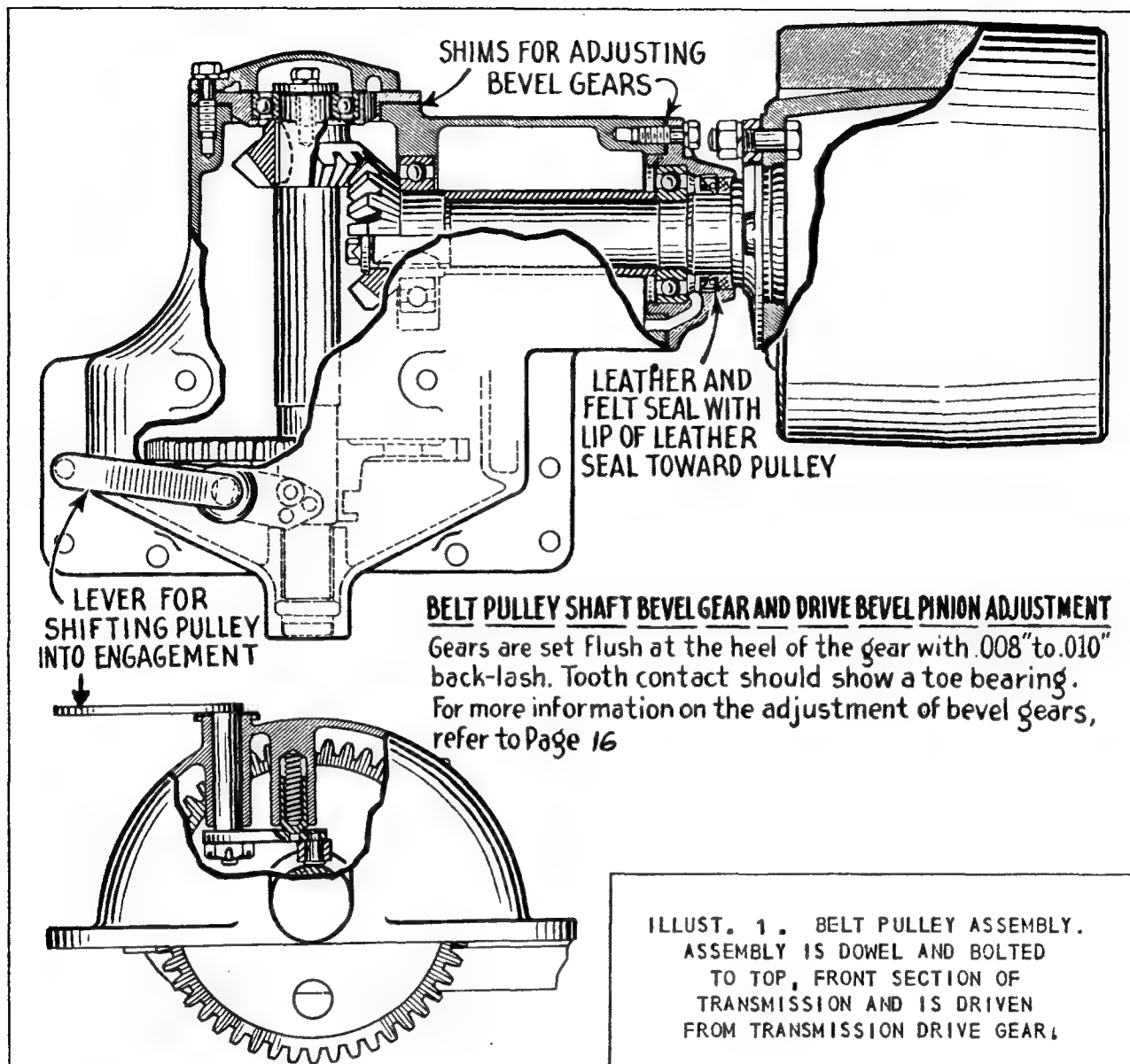
Front Wheel Weight - First Weight.	48600-D
Front Wheel Weight - Second Weight	48602-D
Rear Wheel Fender.	51499-D
Spark Arrestor	51579-D
Adjustable Wide Tread Front Axle	51819-D

Note: When 51819-D is to be used with Cultivator attachments, cultivator shifter lever attachment 49194-D must be included. 51819-D may be used with any type of front wheels listed for use on Farmall M Tractors (Reg. products equipped with regular front axle.) Treads obtainable are - 57", 61", 65", 69", 73", 77" and 81".

96 Inch Tread Rear Axles	52148-D
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Note: Two longer rear axles 52147-D increase the tread of rear wheels from a maximum of 88" to 96".

2½ Inch High Skid Ring	53015-D
Variable Tread Front Wheels (Pneumatic tire type). No. covers one complete wheel with rim for 6.50 x 16 tire - less tire	52697-D
4 Inch Wide Road Ring (For 51" Dia. Wheels with 4" Spade Lugs)	53017-D
8000 Foot Altitude Pistons (5.58 to 1 Ratio)	51767-D
5000 Foot Altitude Pistons (5.15 to 1 Ratio)	51768-D
Channel Rim Rear Wheels - Less Lugs (51" dia. x 2) Two required.	50747-DX
Spade Lugs for Channel Rim Rear Wheels above	50749-D



ILLUST. 2. POWER TAKE-OFF SHAFT

Farmall Model "M" Tractor

Electrical Equipment

Electric Starter and Lights (Battery Type) are considered special equipment for tractors, but indicators are that the demand will be for tractors so equipped. Consequently this means that servicemen should be familiar with electrical equipment.

There is available for the Farmall M five types of electrical equipment namely:

- 1 - Electric Starter only. . . 52037-D
- 2 - Electric Lights only . . . 52038-D
- 3 - Combination Electric Lights and Starter. . . 52722-D
- 4 - Electric Lights for tractors already equipped with Starter. . . 54632-D
- 5 - Starter for tractors already equipped with lights 54633-D

Specifications of the electrical equipment comprising the above are as follows:

GENERATOR: Used on 1, 2, 3, 4 and 5.

Make . . . Delco-Remy, #1101355; IHC, #45634-D
Drive . . . Vee Belt from Water Pump

Regulation . . . 3rd brush and either a resistance in relay box for Starter attachments only or a resistance in the switch box for combination starter and lighting, and lighting. Resistance is connected in the generator field circuit. The one in the switch box is controlled by switch lever.

Output, cold . . . 13 to 16 amperes; 7.7 to 8.1 volts; 1800 R.P.M.

Output, hot . . . 9 to 11 amperes; 7.3 to 7.6 volts; 1900 R.P.M.

Brush spring tension . . . 14 to 18 ounces.

Rotation . . . Clockwise viewing drive end.

CUTOUT RELAY

Purpose . . . The cutout relay is located in the box on top of the generator. It serves as an automatic switch between the generator and battery. When the generator terminal voltage rises to exceed the battery terminal voltage, the contact points close, completing the circuit between the generator and battery. When the generator terminal voltage becomes less than the battery terminal voltage, the relay points open.

Cutout points to close . . . 6.75 to 7.5 volts.

Cutout points to open . . . 0 to 3.5 amperes discharge.

STARTING MOTORS: Used on 1, 3, 4 and 5.

Make . . . Delco-Remy, #1107427; IHC, #49344-D
Drive . . . Bendix

Rotation . . . Clockwise, viewing pinion
No load . . . 65 amperes, 5 volts; 6000 R.P.M.

Lock Torque . . . 15 ft. lb.; 570 amperes; 3.15 volts

Brush spring tension . . . 24 to 28 ounces.

BATTERY: Used on 1, 2, 3, 4 and 5.

Make . . . Prestolite #615-SF . . . used for Starting and Lighting and Starter only.

Capacity . . . $\left\{ \begin{array}{l} 127 \text{ amperes at } 20 \text{ hour} \\ \text{discharge rate} \\ 148 \text{ amperes at } 20 \text{ min.} \\ \text{discharge rate} \end{array} \right.$

Prestolite #613-BE . . . used for lighting only.

Capacity . . . $\left\{ \begin{array}{l} 88 \text{ amperes at } 20 \text{ hour} \\ \text{discharge rate} \\ 105 \text{ amperes at } 20 \text{ min.} \\ \text{discharge rate} \end{array} \right.$

Distance from top of plate of electrolyte liquid . . . 3/8".

Hydrometer readings:

Fully charged . . . 1.275 to 1.300

One-half charged . . . 1.225

Low . . . 1.150

Terminal grounded . . . Positive

Freezing point of discharge battery . . . 5°F. above zero.

Voltage . . . 6

Number of plates . . . $\left\{ \begin{array}{l} 613-BE . . . 13 \\ 615-SF . . . 15 \end{array} \right.$

LIGHTING SWITCH:

Make . . . Delco-Remy, #EX-20124

*Generator field resistance . . . 2.8 ohms.

Dimmer resistance5 ohms.

* This same resistance is in the cutout relay box but is used for starting attachments only.

CAUTIONS:

Do not set generators about their maximum specified charging rate or they will burn out.

When replacing brushes, be sure that they make good contact with commutator before checking charging rate. "00" sandpaper wrapped around commutator may be used to sand in brushes. Never use emery cloth to clean commutator or sand in brushes.

Be sure that all electrical connections are tight. A broken or loose terminal in the battery charging circuit will cause the generator to burn out.

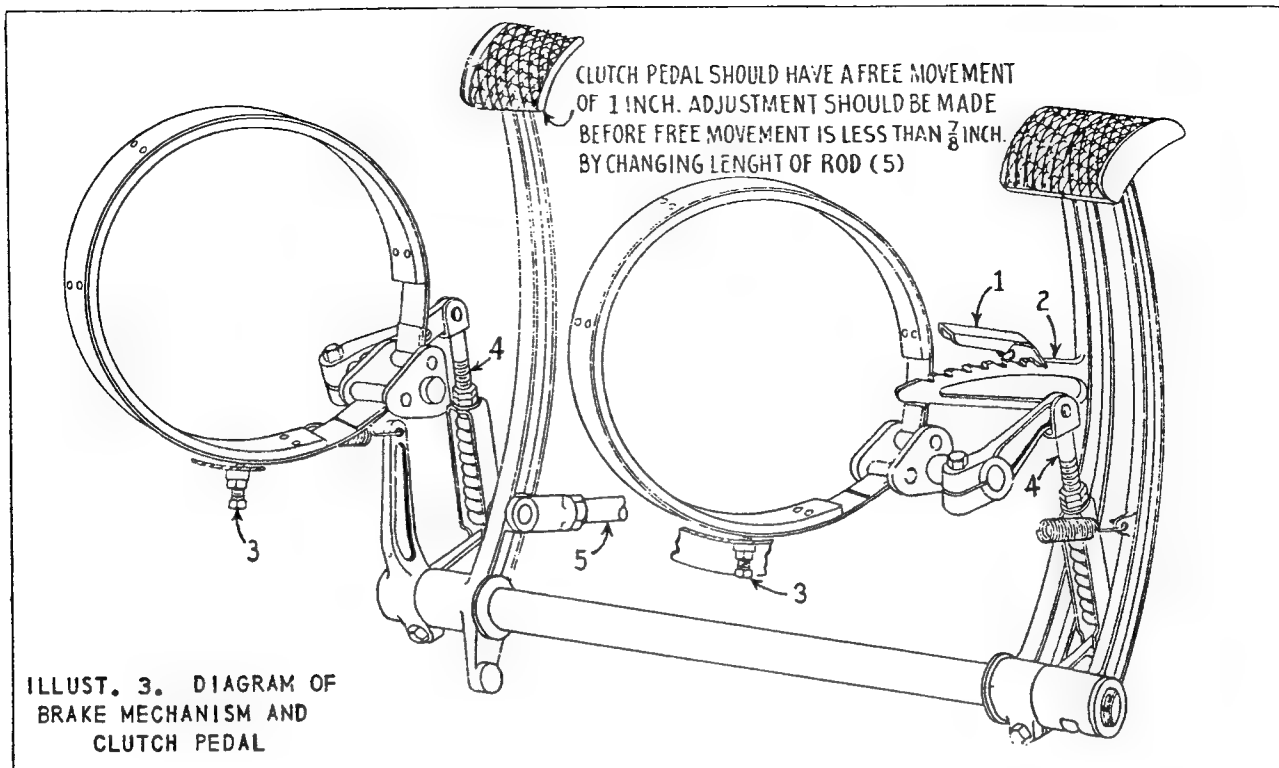
When working on the electrical system always first remove the battery to ground cable.

If the ammeter shows that the generator is not charging and the tractor is to be run for a time before looking for the trouble either remove the generator belt or ground the generator terminal, marked "A", under the relay base to prevent burning out generator.

INSTALLING OR REPLACING FLYWHEEL RING GEAR:

The ring gear is a tight fit on flywheel and should be heated to 500 to 550 degrees F., but not hotter, either on a plate or in an oven. Caution: do not heat gear with welding torch or over a direct flame. Uncontrolled heat will destroy temper of gear.

Brakes



Brakes are external contracting band type. Cast steel brake drums are located on end of differential shafts. Refer to illustration 4. Brakes are operated by two foot pedals and may be applied independently or both at the same time by locking the foot pedals together. Brake facing width 2", dia. $11\frac{1}{2}$ ", area 65 sq. in.

BRAKE ADJUSTMENT: Brakes should not drag and should not require excessive travel of the pedals before they take hold. Pedals should have a free movement of one inch, measured at the pedal pad, or just enough movement so that when a slight pressure is applied on the brake pedals the brake lock (1) will drop into first notch in the rack (2). To adjust brakes, first turn up the set screw (3) in the bottom of the housing as far as it will go then back off the set screw a quarter to a half a

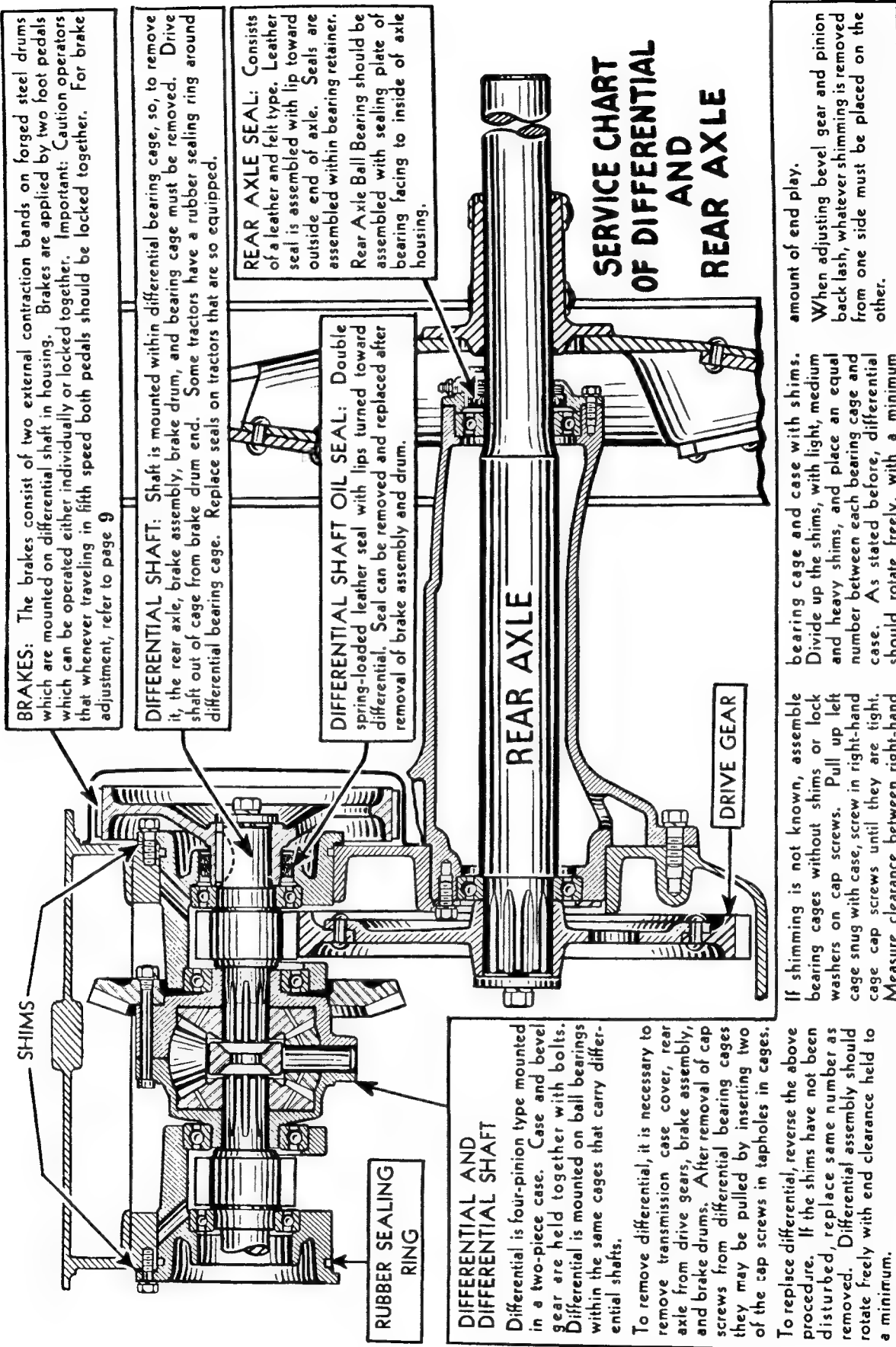
turn and lock it. Secure the correct free pedal movement by changing the length of brake rod (4). The length of the brake rod is changed by removing the pin from the clevis and turning the clevis either to the right or to the left.

It is very important that brake pedals have the same amount of movement, to secure brake equalization. A definite way to check the equalization of brakes is to jack up both rear wheels and block tractor securely, then start the tractor while it is jacked up and operate it either in third or fourth speed. Application of the brakes should stop both wheels at the same time, tending to reduce the speed of the engine. If one wheel stops and the other one continues to revolve, loosen the adjustment on the wheel that stops until both wheels continue to revolve.

REAR AXLE--Refer to Illust. 4

Rear axle may be removed as an assembly with axle carrier by removing cap screws holding carrier to transmission case and the cap screw at splined end of axle holding drive gear. Cap screw holding drive gear can be removed through power take-off shaft hole in rear of transmission case. Axle can be taken out without removing carrier, by removing cap screw at splined

end of axle through power take-off hole and then removing outer bearing retainer. To drive axle out of drive gear, bolt two rear wheel clamps to outer end of axle and apply force to the clamps. Assembly is made in the reverse procedure. Final drive gear must be removed from axle to remove differential shaft bearing cage.



ILLUST. 4. SERVICE CHART OF DIFFERENTIAL AND REAR AXLE

VALVE ADJUSTMENT: Clearance between rocker arm and valve .017" — engine hot. Recheck after tightening rocker-arm assembly or cylinder head. Refer to Instruction Book to set valve clearance.

SPARK PLUG: Should be removed every 200 to 300 hours or oftener for cleaning and checking of electrode gap. Gap should be .020 to .025". When adjusting gap, bend only out-side electrode. Sand blasting is recommended method of cleaning spark plugs. Check plugs for correct type as to heat range.

PISTON: Grey Iron. Select fit-in sleeve to give .004 to .005" normal measured clearance. A $\frac{1}{2}$ " wide .0035" ribbon gauge may be used as a "Go" gauge with a light pull of about 4 to 6 lb. tension. A .0045" ribbon may be used as a "No Go" gauge with a tight pull of about 11 to 14 lb.

OIL FILTER

PISTON PIN: Pin floats in rod and piston and is held in piston by two spring retainer rings. Pin clearance in rod bushing .0007", clearance in piston .0005". Pin dia. 1.312 "

MAGNETO DRIVE GEAR

CONNECTING - ROD: Rod should be straight, free from twist and parallel with piston; cylinder numbers are stamped on rod and cap, No. 1 starting from front end of engine. Assemble numbered side toward camshaft.

OIL PUMP: Gear type pump. Pump should just turn freely with minimum of end play in drive shaft.

OIL PRESSURE REGULATING SPRING: Oil pressure 60 lb. at 1450 R.P.M. Spring should test 38.3 lb. when compressed to $2\frac{3}{4}$ ". Free length $3\frac{19}{32}$ ".

VALVE SPRING: Spring should test 59 lb. when compressed to $1\frac{23}{32}$ ". Free length $2\frac{1}{8}$ ".

VALVE AND VALVE GUIDE: Clearance in guide .002 to .004". Valve stem dia. .371 to .372". Valve guide assembled with chamfered end up. If valves leak reface them by the conventional method. Valve guide bore and seat should be concentric within .002". Valve seat width $\frac{3}{16}$ ". Repair valve guides are reamed to size and should project $\frac{31}{32}$ " above cylinder head.

EXHAUST MANIFOLD HEAT VALVE in close position.

PISTON RINGS: Set consists of three compression and one oil control. Third compression ring is tapered and should be installed with the word "Top" toward top of piston. When re-ringing a used piston and sleeve, fit rings to smallest section of sleeve bore in which the ring travels. Ring gap .010 to .020". When checking gap be sure ring is square in sleeve bore. Ring clearance in groove — top compression .004". 2nd and 3rd compression and oil control .003". Ring grooves should be clean, free from carbon and oil drain holes in oil control groove drilled out. Stagger ring gaps and flood piston with oil before installing in sleeve.

GOVERNOR DRIVE GEAR

IDLER GEAR

TIMING GEARS: Punch mark on gears should line up to assure correct valve timing and magneto timing.

CYLINDER SLEEVE: Sleeve is dry liner type and can be removed and replaced the same as a wet type sleeve, requiring no boring or honing after assembly. The production sleeve and crankcase bore are stamped with identification letters, but it is not necessary to pay any attention to these letters when replacing new sleeves.

OIL LEVEL

CONNECTING-ROD BOLT: Size $\frac{1}{8}$ " special. Pull cap screws to a tension of 650 in. lb. or 54 ft. lb.

FLOAT OIL SCREEN

CRANKSHAFT BEARING BOLT: Size $\frac{1}{8}$ ". Tension, 1200 in. lb. or 100 ft. lb.

SERVICE CHART SHOWING CROSS SECTION THROUGH END OF ENGINE

BEVEL GEAR AND PINION ADJUSTMENT:

Gears are straight bevel type. They should be set flush with each other at outer end or heel (large end) of tooth with .008 to .012" back-lash for initial trial. Then move pinion in or out to secure a position at which gears run the quietest. Pinion may be moved in or out by taking out or placing shims between main shaft bearing cage and transmission case. Back-lash is changed by varying number of shims between differential shaft bearing cage and transmission case. Shims removed from one side must be placed on other side.

Tooth contact should show a toe bearing (small end of tooth). For detailed information on setting of gears, refer to Page 16

TRANSMISSION AND FINAL DRIVE GEAR CASE COVER is all one piece and may be removed as one unit together with gear shifter mechanism.

CRANKSHAFT REAR OIL SEAL: Felt type. Flywheel must be removed to replace seal. If seal shows indication of leaking in addition to replacing seal, check rear bearing for excessive clearance and fit of expanding plug at rear of camshaft.

Remove magneto working safely possible starting

VENTILATING PIPE CONNECTED TO AIR INTAKE: Ventilates governor housing and valve chamber.

DIFFERENTIAL SHAFT PINION

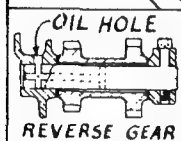
SCREW FOR LOCKING OUT 5th SPEED

Shims for adjusting bevel gear and pinion.

TRANS. DRIVE ASSEMBLY

REAR AXLE DRIVE GEAR

Space for Lift-All and for removing clutch.



CLUTCH: Single plate, dry disc, foot operated type. Clutch release fingers are adjustable externally through an opening in bottom of clutch housing.

Clutch is removable through an opening in bottom of clutch housing. The procedure for removal is as follows:

1. Remove four bolts from the clutch joint (1).
2. Remove clutch release sleeve carrier (2).
3. Remove clutch shaft together with thrust bearing.
4. Remove three cap screws holding clutch to flywheel and after placing washers under the head of cap screws transpose them to the three holes provided for compressing clutch spring.
5. Remove the remaining cap screws and lift out clutch.
6. Reassembly is made in the reverse procedure, but be sure to install clutch shaft before releasing pressure on clutch springs, and be sure to assemble clutch joint ring with convex side toward clutch. Clutch is equipped with nine pressure springs which should test 180 to 190 lbs. when compressed to 1 1/2".

Two thickness linings (1/8" and 3/16") are used on clutch plate and should be assembled alternately. If clutch is torn down and reassembled, make assembly of fingers to dimensions shown on illustration before installing.

TRANSMISSION: Gears and shafts can be removed from top of transmission after removal of transmission case cover and clutch shaft by following procedure as outlined.

1. Pull transmission drive shaft coupling.
2. Remove transmission drive assembly.
3. Remove transmission main shaft (spline shaft with pinion).
4. Remove brake cross shaft.
5. Remove countershaft rear bearing snapping and drive out bearing with a brass bar.
6. Remove front countershaft nut, bearing retainer and drive countershaft back out of inner bearing race.
7. Drive front bearing out of case.
8. Push countershaft assembly back in transmission case and raise front end out. Assembly of transmission is made in the reverse manner.

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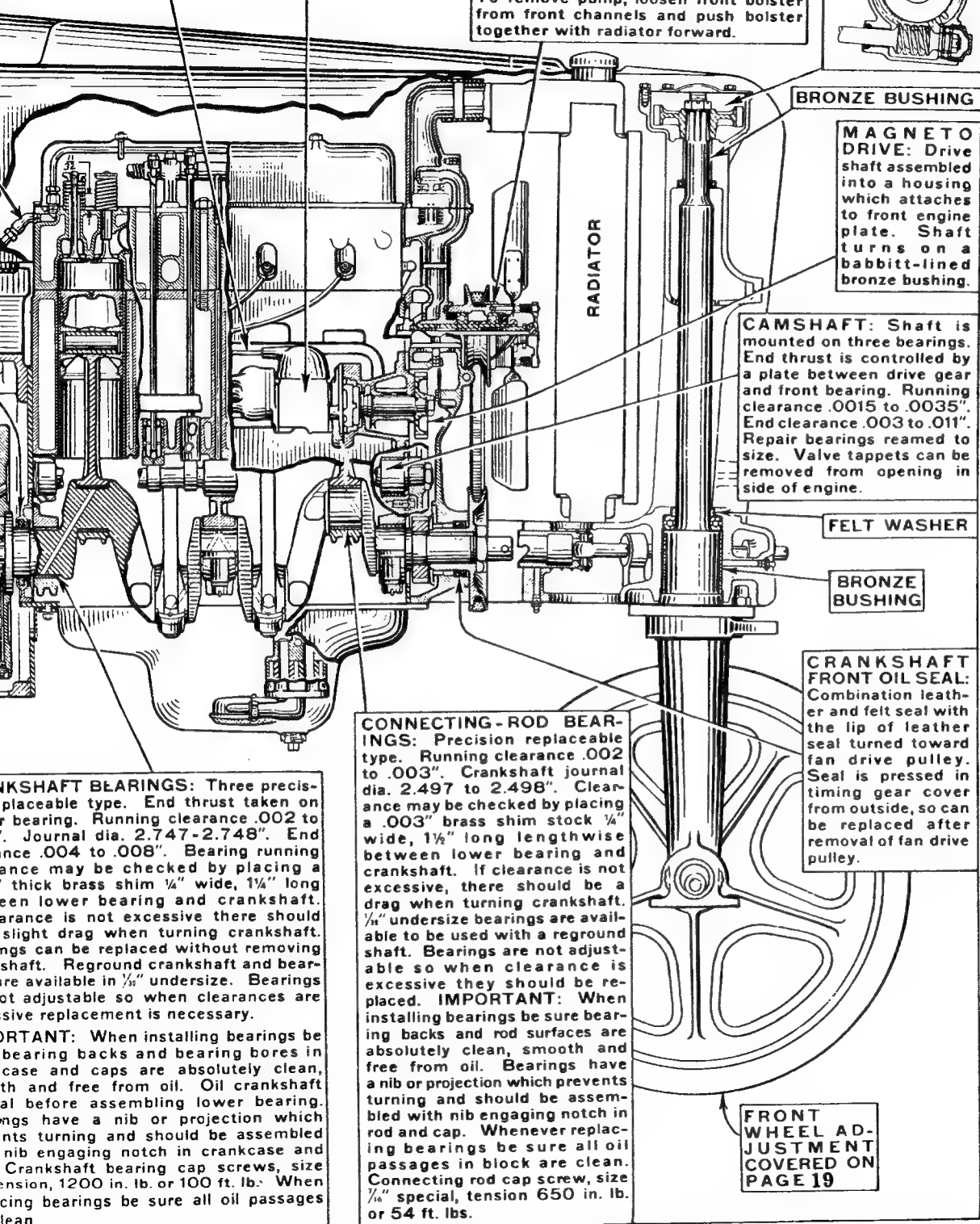
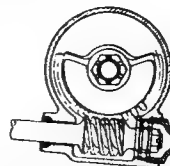
re high-tension
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MAGNETO: I.H.C. Model H-4 with automatic impulse coupling. Timing of magneto to engine is covered in Instruction Book, as is breaker point setting and lubrication. Service of magneto is covered in a Supplement to Servicemen's Magneto Guide.

WATER PUMP: Pump is same design as the one having been used on pump-equipped I.H.C. engines for years. Pulley is carried on two roller bearings which are sealed with leather type seals. Inner seal has leather lip turned toward bearing. Outer seal is assembled with lip away from bearing. Pump drive shaft floats free on two bronze bushings and is packed with three sets of packing, allowing for several adjustments of packing nut before requiring packing replacement.

To remove pump, loosen front bolster from front channels and push bolster together with radiator forward.

STEERING SECTOR: When replacing bearing retainer coat threads with a sealing compound to prevent the possibility of oil leakage.



BRONZE BUSHING

MAGNETO DRIVE: Drive shaft assembled into a housing which attaches to front engine plate. Shaft turns on a babbitt-lined bronze bushing.

CAMSHAFT: Shaft is mounted on three bearings. End thrust is controlled by a plate between drive gear and front bearing. Running clearance .0015 to .0035". End clearance .003 to .011". Repair bearings reamed to size. Valve tappets can be removed from opening in side of engine.

FELT WASHER

BRONZE BUSHING

CRANKSHAFT FRONT OIL SEAL: Combination leather and felt seal with the lip of leather seal turned toward fan drive pulley. Seal is pressed in timing gear cover from outside, so can be replaced after removal of fan drive pulley.

CONNECTING-ROD BEARINGS: Precision replaceable type. Running clearance .002 to .003". Crankshaft journal dia. 2.497 to 2.498". Clearance may be checked by placing a .003" brass shim stock $\frac{1}{4}$ " wide, $1\frac{1}{2}$ " long lengthwise between lower bearing and crankshaft. If clearance is not excessive, there should be a drag when turning crankshaft. $\frac{1}{16}$ " undersize bearings are available to be used with a reground shaft. Bearings are not adjustable so when clearance is excessive they should be replaced. **IMPORTANT:** When installing bearings be sure bearing backs and rod surfaces are absolutely clean, smooth and free from oil. Bearings have a nib or projection which prevents turning and should be assembled with nib engaging notch in rod and cap. Whenever replacing bearings be sure all oil passages in block are clean. Connecting rod cap screw, size $\frac{7}{16}$ " special, tension 650 in. lb. or 54 ft. lbs.

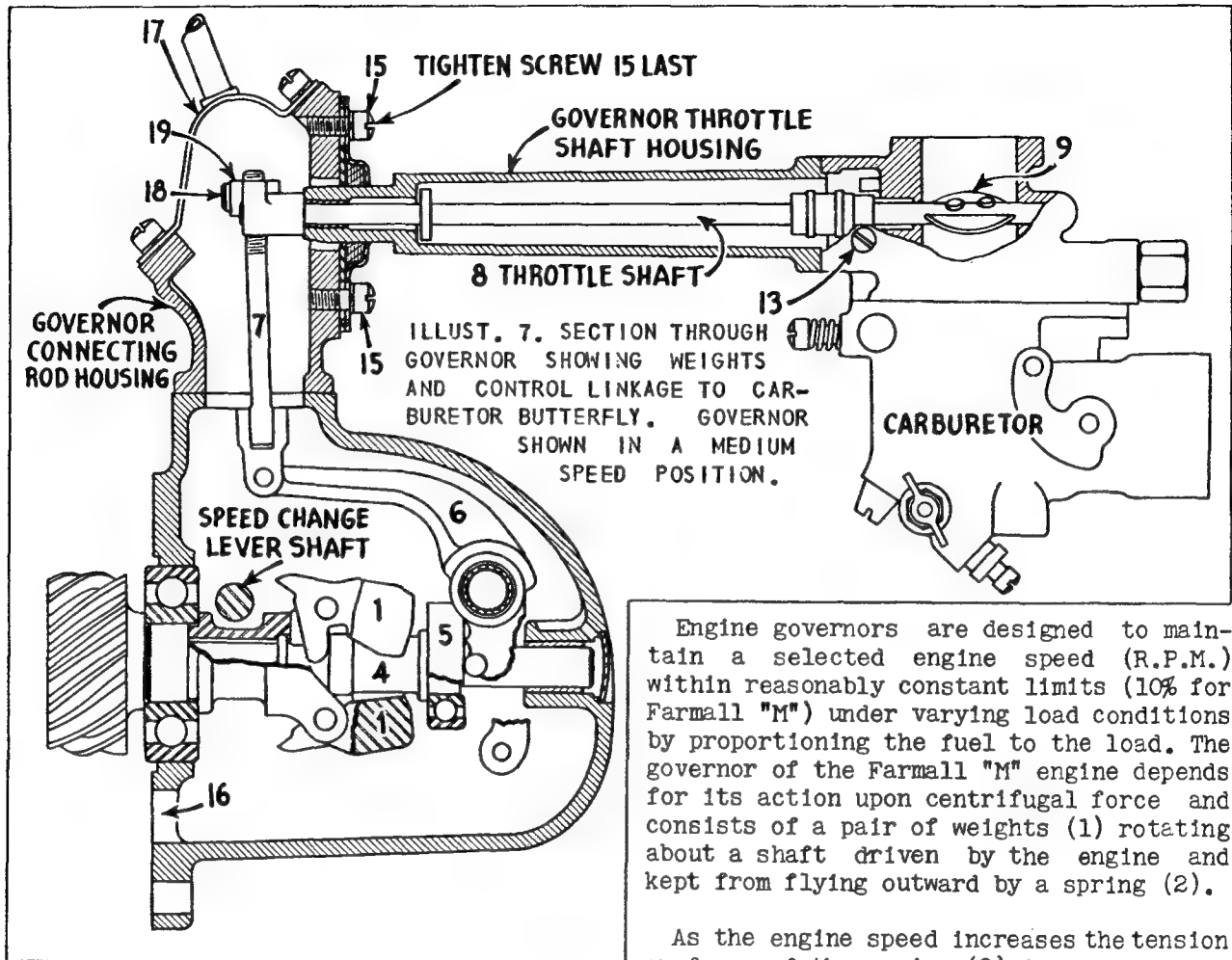
CRANKSHAFT BEARINGS: Three precision replaceable type. End thrust taken on front bearing. Running clearance .002 to .003". Journal dia. 2.747-2.748". End clearance .004 to .008". Bearing running clearance may be checked by placing a .003" thick brass shim $\frac{1}{4}$ " wide, $1\frac{1}{4}$ " long between lower bearing and crankshaft. If clearance is not excessive there should be a slight drag when turning crankshaft. Bearings can be replaced without removing crankshaft. Reground crankshaft and bearings are available in $\frac{1}{16}$ " undersize. Bearings are not adjustable so when clearances are excessive replacement is necessary.

IMPORTANT: When installing bearings be sure bearing backs and bearing bores in crankcase and caps are absolutely clean, smooth and free from oil. Oil crankshaft before assembling lower bearing. Bearings have a nib or projection which prevents turning and should be assembled with nib engaging notch in crankcase and cap. Crankshaft bearing cap screws, size 1200 in. lb. or 100 ft. lb. When installing bearings be sure all oil passages are clean.

FRONT WHEEL ADJUSTMENT COVERED ON PAGE 19

Engine Governor

Refer to Illust. 7, 8, 9, 10 and 11.

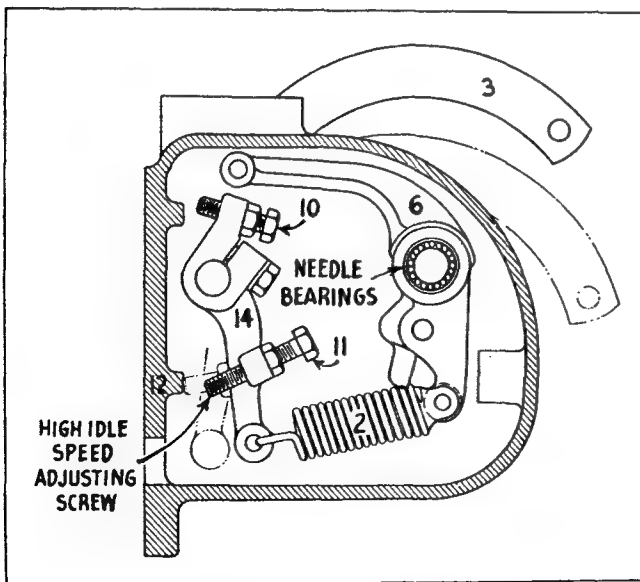


Engine governors are designed to maintain a selected engine speed (R.P.M.) within reasonably constant limits (10% for Farmall "M") under varying load conditions by proportioning the fuel to the load. The governor of the Farmall "M" engine depends for its action upon centrifugal force and consists of a pair of weights (1) rotating about a shaft driven by the engine and kept from flying outward by a spring (2).

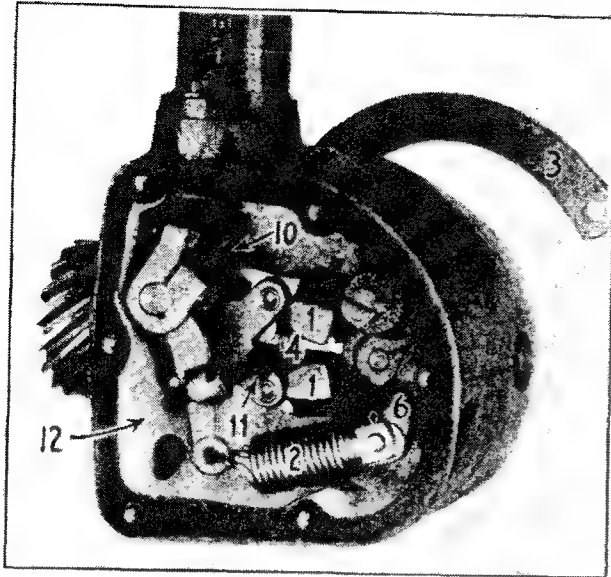
As the engine speed increases the tension or force of the spring (2) is overcome and the weights move outward until the spring tension is increased to balance their outward action. The more tension on the spring (controlled by speed change lever (3)) the greater will be the speed of the engine. The motion of the governor weights (1) moving outward, is transmitted by sleeve (4) on the governor shaft through ball bearing (5), to lever (6), to Governor Connecting Rod (7) and then to throttle shaft (8) which closes butterfly (9).

When the governor weights are together with tension on governor spring (2) and the engine stopped, the carburetor butterfly should be in a wide open position -- Vertical in Carburetor.

GOVERNOR ADJUSTMENT. To adjust the governor remove cover from the side of the governor housing which gives free access to adjusting screws. Two screws are provided. Screw (11) controls the maximum high idle speed. Screw (10) limits the travel of lever (14). The maximum high idle speed is defined as the speed at



Engine Governor—Continued



ILLUST. 9. R. H. VIEW OF GOVERNOR

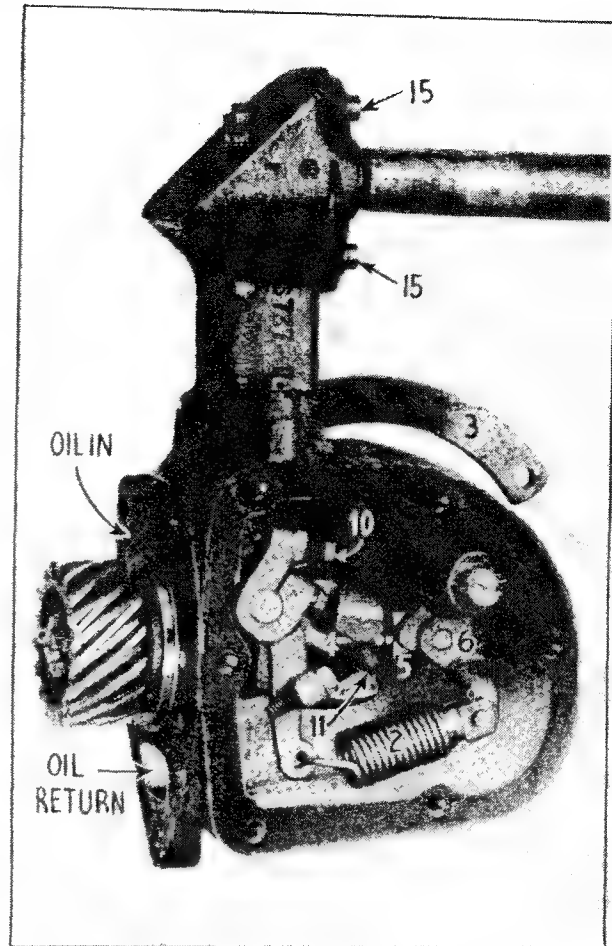
which the engine runs with the speed control hand lever in wide open position (all the way back toward steering wheel) and the engine running without a load. This pre-determined speed (1595 R.P.M. for the Farmall "M" engine) assures the butterfly valve being in a wide open position when the engine is running at its rated load speed of 1450 R.P.M. and pulling its rated load.

Proceed to adjust the governor as follows:

Upper stop screw (10) on governor control lever should be so adjusted that governor spring (2) is free when stop screw (10) is just against its stop in the governor housing and when the low idle screw (13) in carburetor is adjusted for the correct low idle speed of approximately 450 R.P.M. When screw (10) is turned too far in toward housing it will not be possible to set the low idle speed of the engine.

Pull speed change lever (14) back against stop (12) in governor housing by pulling governor control hand lever on the steering post all the way back toward steering wheel. If hand control lever does not bring speed change lever (14) back against stop (12) make the necessary adjustment in the control linkage.

Engine speed should be 1595 R.P.M. (Fast idle speed) Speed can be taken at the power take-off shaft (611.7 R.P.M.) belt pulley (1023.7 R.P.M.) or by jacking up both rear wheels and taking speed of axle in 4th gear (35.3 R.P.M.)



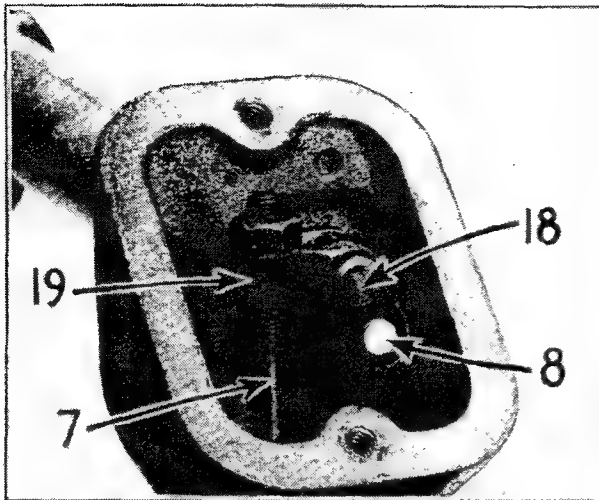
ILLUST. 10. L. H. VIEW OF GOVERNOR

To increase the speed screw out on adjuster (11). To reduce speed turn adjuster in. Be sure to lock screw with lock nut.

LOW IDLE ADJUSTMENT OR MINIMUM SPEED ADJUSTMENT. This is the lowest speed at which the engine will run with the speed control lever all the way toward the front of the engine (away from operator). This speed for the Farmall "M" is approximately 450 R.P.M. Adjustment is made by turning screw (13) at carburetor in or out. If screw (10) is set in too far low idle speed cannot be secured.

SYNCHRONIZING GOVERNOR AND CARBURETOR BUTTERFLY. It is very important that the linkage connecting the governor weight movement to the carburetor butterfly is not worn excessively and is correctly adjusted. To check this adjustment remove the governor connecting rod housing cover and ventilating tube (17). Place the speed control lever all the way toward the steering wheel so maximum tension is

Engine Governor—Continued



ILLUST. 11. SHOWS THROTTLE
SHAFT CONNECTION TO GOVERNOR

imposed on spring (2). Remove pin (18) from the connecting rod adjusting block (19). Pull throttle shaft lever (8) and Governor connecting rod adjusting block (19) as far up as they will go, (refer to Illust. 11), with the two parts in this position pin (18) should slide freely in place. If pin does not, adjust the governor connecting rod adjusting block so that pin does slide freely in place.

REPAIRING GOVERNOR: The governor construction is very simple and can be readily dismantled for repair. Remove the complete assembly by disconnecting the Throttle Shaft housing from carburetor and governor housing from engine and proceed to dismantle the parts.

After assembly of governor to engine and carburetor, loosen screws (15) holding felt retainer to connecting rod housing and retighten them. This is to prevent any possibilities of strains and misalignments in governor throttle shaft. Check governor linkage for freeness and be sure there is no binding at any point.

Lubricant is forced to the governor by intermittent pressure from the lubricating system and returns to the oil pan through opening in the bottom of housing.

Governor shaft revolves on a ball bearing and bronze bushing. Governor lever (6) is mounted on needle bearings. All these factors of construction hold friction to a minimum resulting in a smooth acting governor.

Governor housing is vented by a pipe which leads to the air intake pipe between carburetor and air cleaner.

Setting Bevel Gears

BEVEL GEAR AND PINION TOOTH CONTACT

Bevel gears of the Farmall "M" are straight bevel gear type. Proper adjustment is important to obtain quiet and durable gears. Two factors must be taken into consideration in obtaining proper tooth contact. First along the tooth, a lengthwise bearing; the other, up and down the tooth—a profile bearing (Refer to Illust. 14).

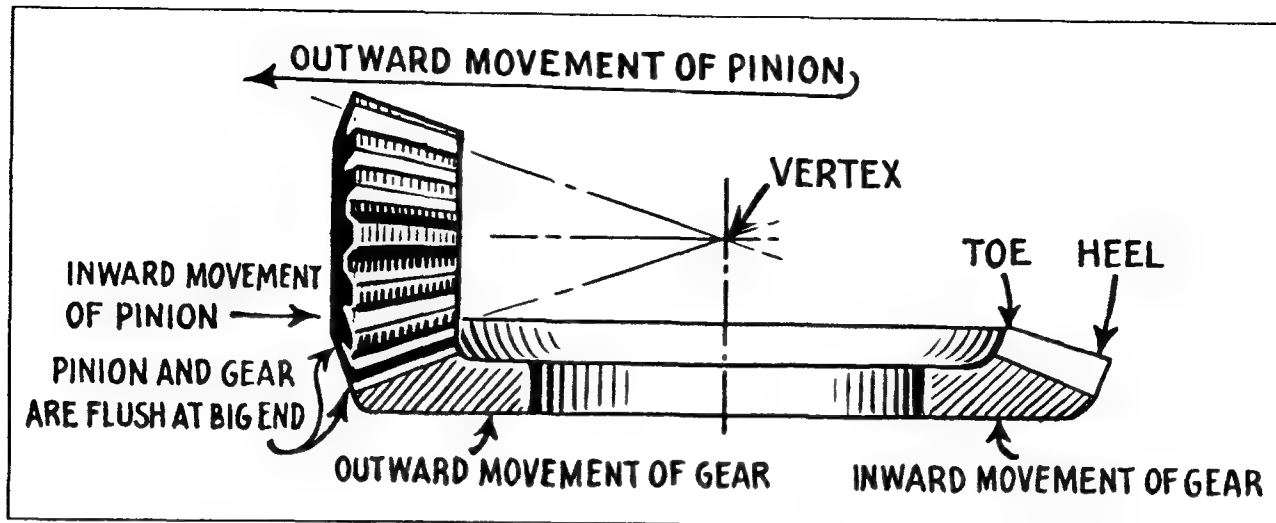
Bevel gears are cut with a pre-determined amount of back-lash, Illust. 13, depending upon the size or pitch of the teeth. For the Farmall "M" the back-lash varies from .008 to .012" (drive gears).

Gears are machined to run flush with each other at the other (heel or large end) of the tooth, Illust. 12, and should be so set for initial trial. It is not dependable to rely on just setting the gears flush to secure good performance of bevel gears. The pinion should be moved in or out to secure the position at which gears run the quietest, and the tooth contact

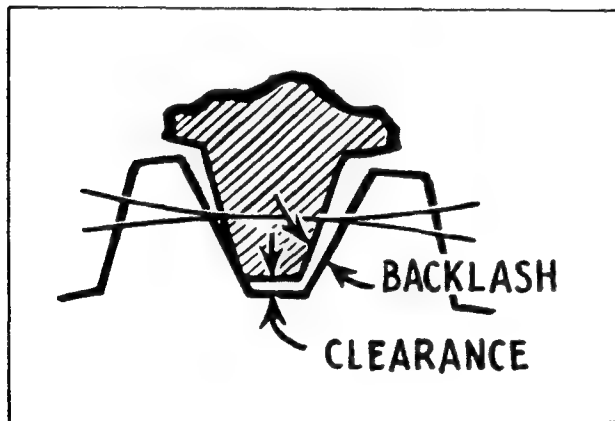
should be checked by painting them with red lead or Prussian Blue. The following illustration will show correct tooth contact.

Bevel gears when installed should show a bearing toward toe or small end of the tooth, Illust. 15, never at the heel or large end, Illust. 21, the reason being that it is practically impossible to make gears and gear mounting rigid enough so that there will not be some deflection when subjected to full load. This tends to cause the tooth bearing to move toward the heel of the tooth and when gears are adjusted so the bearing is toward the heel of tooth it results in a concentration of load on the top corner of the heel and possible breakage may result. To check tooth contact of bevel gears paint teeth on ring gear with red lead or Prussian Blue. Turn the gears by hand or by power, if possible, with a light load on the drive gear. Application of brakes will suffice for the load. Check the results obtained by the following illustration of gear teeth.

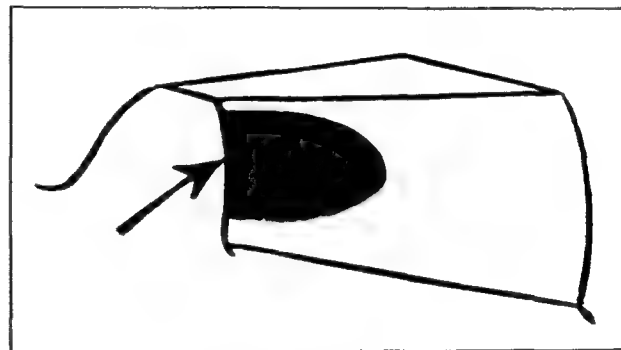
Setting Bevel Gears—Continued



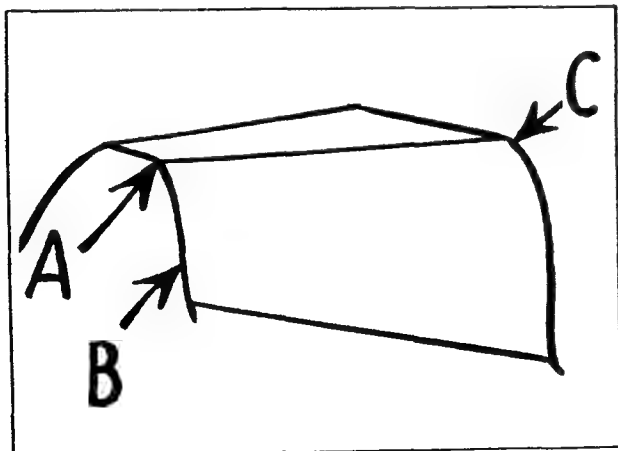
ILLUST. 12. SHOWS A PAIR OF BEVEL GEARS IN MESH AND INDICATES THE MEANING OF NAMES USED IN GEAR SETTING.



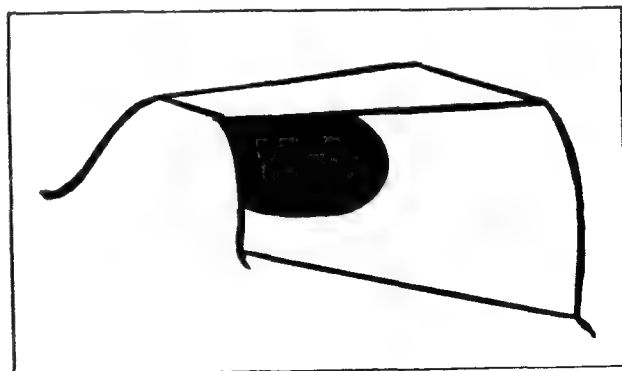
ILLUST. 13. SHOWS WHAT IS MEANT BY BACKLASH AND CLEARANCE.



ILLUST. 15. SHOWS TYPE OF BEARING PREFERRED ON GEAR TOOTH WHEN NOT UNDER HEAVY LOAD. THIS TYPE OF CONTACT SHOULD GIVE QUIET RUNNING GEARS AND IS CALLED TOE BEARING. ATTEMPT TO SECURE TOOTH CONTACT AS SHOWN WHEN SETTING BEVEL GEARS.

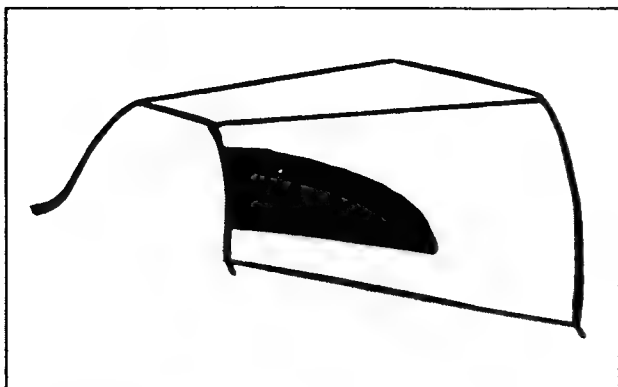


ILLUST. 14. SHOWS A BEVEL GEAR TOOTH. FROM "A" TO "B" IS THE PROFILE OF TOOTH. FROM A TO C IS FULL LENGTH OF TOOTH.

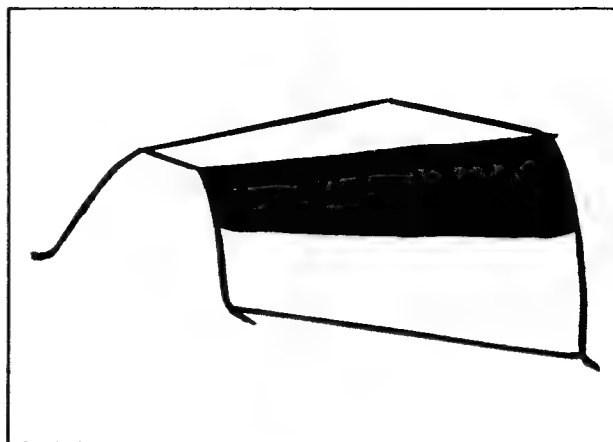


ILLUST. 16. SHOWS BEARING TOO HIGH ON GEAR TOOTH CAUSED BY PINION BEING TOO FAR OUT FROM RING GEAR. TO CORRECT THIS CONDITION MOVE PINION IN AND ADJUST RING GEAR FOR BACKLASH.

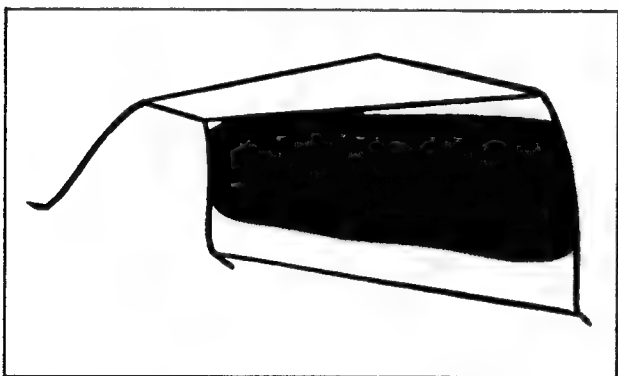
Setting Bevel Gears—Continued



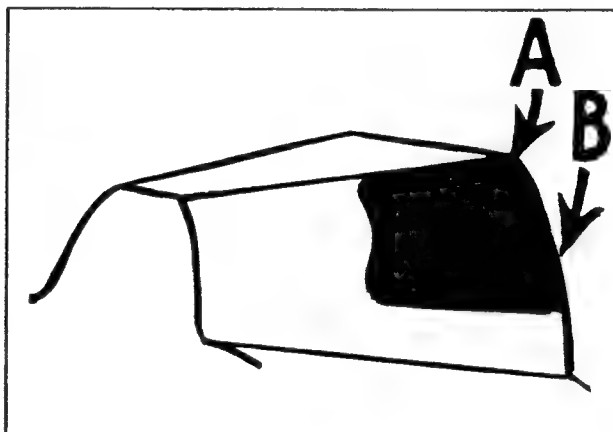
ILLUST. 17. SHOWS BEARING TOO LOW ON GEAR TOOTH AND IS CAUSED BY PINION BEING IN TOO FAR TOWARD RING GEAR. TO CORRECT TOOTH BEARING, MOVE PINION OUT FROM RING GEAR AND ADJUST RING GEAR BACKLASH.



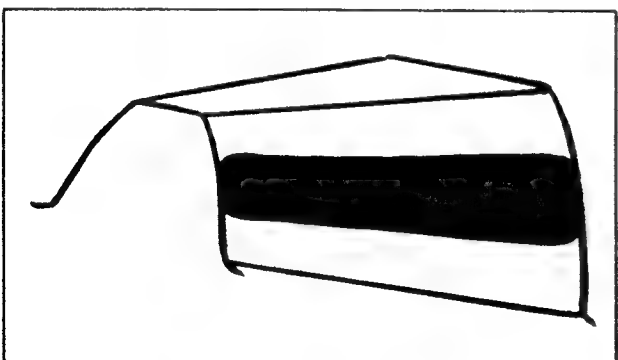
ILLUST. 20. THE TOOTH BEARING SHOWN IS TOO HIGH AND INDICATES PINION IS OUT TOO FAR. TO CORRECT, MOVE PINION IN AND ADJUST RING GEAR FOR CORRECT BACKLASH.



ILLUST. 18. WHEN GEARS ARE CHECKED WITHOUT LOAD THEY SHOULD SHOW A TOOTH CONTACT AS IN ILLUST. 15. HOWEVER WHEN UNDER LOAD THE BEARING SHOULD BE THE FULL LENGTH OF TOOTH. DEFLECTION OF THE PINION MOUNTING CAUSES THE BEARING TO GO TO THE HEEL OF TOOTH.



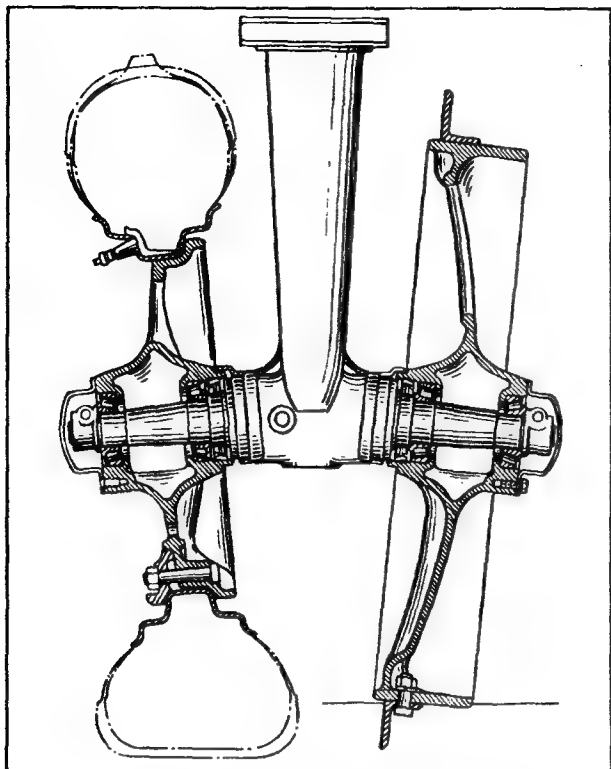
ILLUST. 21. SHOWS A HEEL BEARING. DESIRABLE CONDITION IS TO HAVE A TOE BEARING. THIS GEAR WOULD NOT BE NOISY IF THE BEARING WAS UNIFORM FROM A TO B ON PROFILE OF THE TOOTH. RING GEAR SHOULD BE ADJUSTED TOWARD PINION.



ILLUST. 19. IF A BEARING ON GEAR TOOTH IS OBTAINED AS SHOWN, WHICH IS TOO LOW, PINION IS SET IN TOO FAR. TO CORRECT, MOVE PINION OUT AND ADJUST RING GEAR FOR BACKLASH.

When assembling the gears in tractor do not be concerned about the length of bearing from toe to heel. If bearing is on the toe it may be left there. If bearing is on the heel, do not try to adjust gears for a full bearing on teeth, but particular attention must be paid to a high or low bearing on the profile of the tooth. Gears will be noisy and eventually ruined if the bearing is too high or too low on the tooth profile. If pinion and gear have been run for any length of time at incorrect setting it will be impossible to reset them to run quiet again. Recommended practice is to make replacements with matched gears.

Front Wheels



ILLUST. 22. SECTION THROUGH FRONT WHEELS--ONE STEEL WHEEL AND ONE PNEUMATIC WHEEL SHOWN.

Wheels revolve on two tapered roller bearings which are sealed by a leather, felt and labyrinth seal.

To adjust bearings jack up front end of tractor so wheels turn freely. Tighten nut, revolving wheel at the same time, till wheel starts to drag, then back off nut a quarter turn and lock with locking bolt.

Wheels should be removed every 6 months of operation, bearings and interior of wheels cleaned and repacked with grease.

IHC 1½ Updraft Carburetor

Refer to Illust. 23.

The functions of a carburetor are: (1) To discharge into the air stream entering the engine the desired amount of fuel; (2) To atomize the fuel and, (3) To make a homogenous air fuel mixture. It is not desirable that the air fuel ratio should be constant for all loads and speeds, (For example: It should be richer in light loads than at heavy loads). The carburetor should vary the ratio so as to give best performance of the engine under all its operating conditions. The carburetor on the Model M has been calibrated and meters the correct amount of fuel for smooth operation throughout the operating range. So it is well to keep in mind that the function of the carburetor cannot extend beyond the proportionate mixing of fuel and air. When diagnosing engine troubles, do not be too hasty in condemning the carburetor.

EXPLANATION OF CARBURETOR

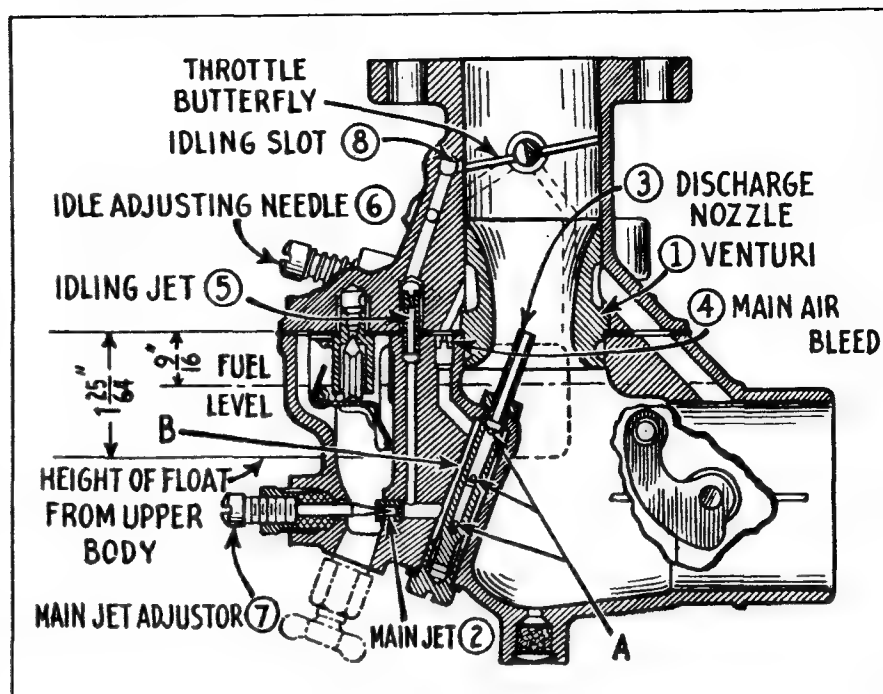
This carburetor is a plain tube single venturi type having an air bleed well method of compensation.

Refer to the Illust. 23, the removable venturi, (1) measures the volume of air which passes through the carburetor and creates a metering vacuum which acts on the discharge nozzle (3) the main jet (2) and the main air bleed (4). The main jet (2) often referred to as the (high speed jet) exerts its principal influence at the full load speed. Fuel from the bowl is metered through the main jet and discharged in the air stream at the point of greatest suction in the venturi. The main jet determines the maximum amount of fuel which may be obtained for full load operation. The main jet adjustment (7) reduces this amount as it is turned toward its seat.

The metering vacuum in the venturi increases faster than the volume of air flowing through the venturi. This would cause an increasingly richer mixture of fuel to air as the engine speed increases to full load, unless this tendency is compensated for. To overcome this variation

Carburetor—Continued

the solid fuel is bled out by air which is admitted from the space around the venturi through the main air bleed (4) and into the space "B" surrounding the discharge jet (3). This air space is known as the well or sometimes the accelerating well. The air enters the solid fuel from the main jet through the holes "A". The well vent meters the amount of air which is admitted to the fuel and allows a proportionately larger amount of air to be bled in as the suction on the discharge jet increases, thereby maintaining the fuel to air ratio fairly constant.



ILLUST. 23. SCHEMATIC SECTION THROUGH CARBURETOR

IDLING SYSTEM

The idling system consists of an idling jet (5) idle air adjusting needle (6) and an idle slot (8). The idling jet (5) receives its fuel from the main jet and sprays it into the air which is admitted from behind the venturi (1). The amount of air is controlled by the idle air adjusting needle (6).

The idling system controls the mixture ratio from slow idle to approximately fast idle. The fast idle to wide open throttle or overload it has very little effect. At overload or when the butterfly valve is in a wide open position the idle system reverses its flow and becomes an air bleed to the main fuel through the holes "A" in the discharge jet. The idling slot (8) is so arranged that the mixture is varied to suit engine requirements as the throttle butterfly is opened across or by it.

ECONOMIZER

At full power or wide open throttle a certain mixture of fuel and air is required. Under part load a leaner mixture may be used. The tendency of the carburetor is to richen up as the throttle is closed and as the idle system starts to become active. The $1\frac{1}{4}$ carburetor is arranged with a passageway leading from a space over the fuel through a slot in the throttle shaft to the idle bypass channel. This slot is closed. When butterfly is

in idle position and opens up as the throttle is opened. When the slot is open the air bleed from the fuel bowl destroys any affect of the idle system richening up the mixture.

ADJUSTING CARBURETOR

The proper mixture of fuel and air is controlled by the main fuel adjustment and the idle fuel adjustment. The throttle position to give the proper idling engine speed is controlled by the idle throttle stop screw. Refer to Illust. 7, item (13).

NOTE: The carburetor is correctly set when shipped from the factory. If setting has been disturbed, the following procedure should be followed:

Before starting the engine, set the main fuel adjusting screw 2-1/2 to 3 turns open and the idle fuel adjusting screw 1 to 1-1/2 turns open. Also set manifold heat control valve in "Hot" position.

MAIN FUEL ADJUSTMENT

After starting, allow engine to run on gasoline about 20 minutes with governor control hand lever fully advanced and manifold heat control valve in "Hot" position.

When heat indicator pointer shows in the green part of the dial, change over to operate on distillate or kerosene. After

Carburetor—Continued

fuel bowl is full of distillate or kerosene, turn main fuel adjustment in until engine starts to miss or operate unsteadily, then unscrew until steady running is obtained. For satisfactory operation and power this adjustment should be checked under load.

For best operation and minimum dilution, keep adjustment as lean as possible. Screw in for lean and out for rich load mixture.

IDLE FUEL ADJUSTMENT

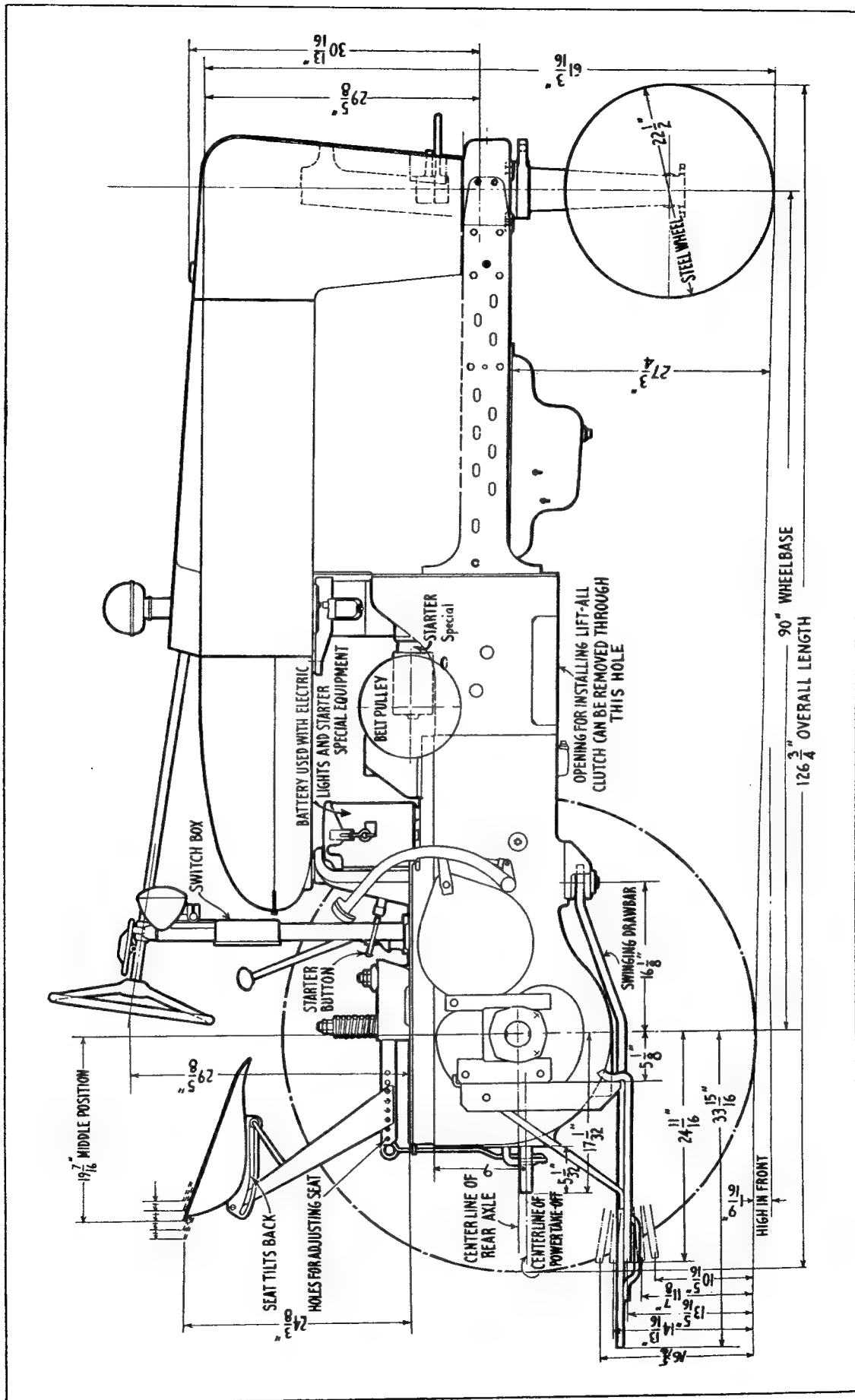
Retard governor control hand lever to about 1/4 advance. Screw in idle throttle stop screw until the engine speed increases slightly. Now screw idle fuel adjusting screw until engine runs steadily. Unscrew

idle throttle stop screw until the engine idles at desired speed with governor control hand lever in full retard position. Idle adjusting screw turns in for rich and out for lean mixture.

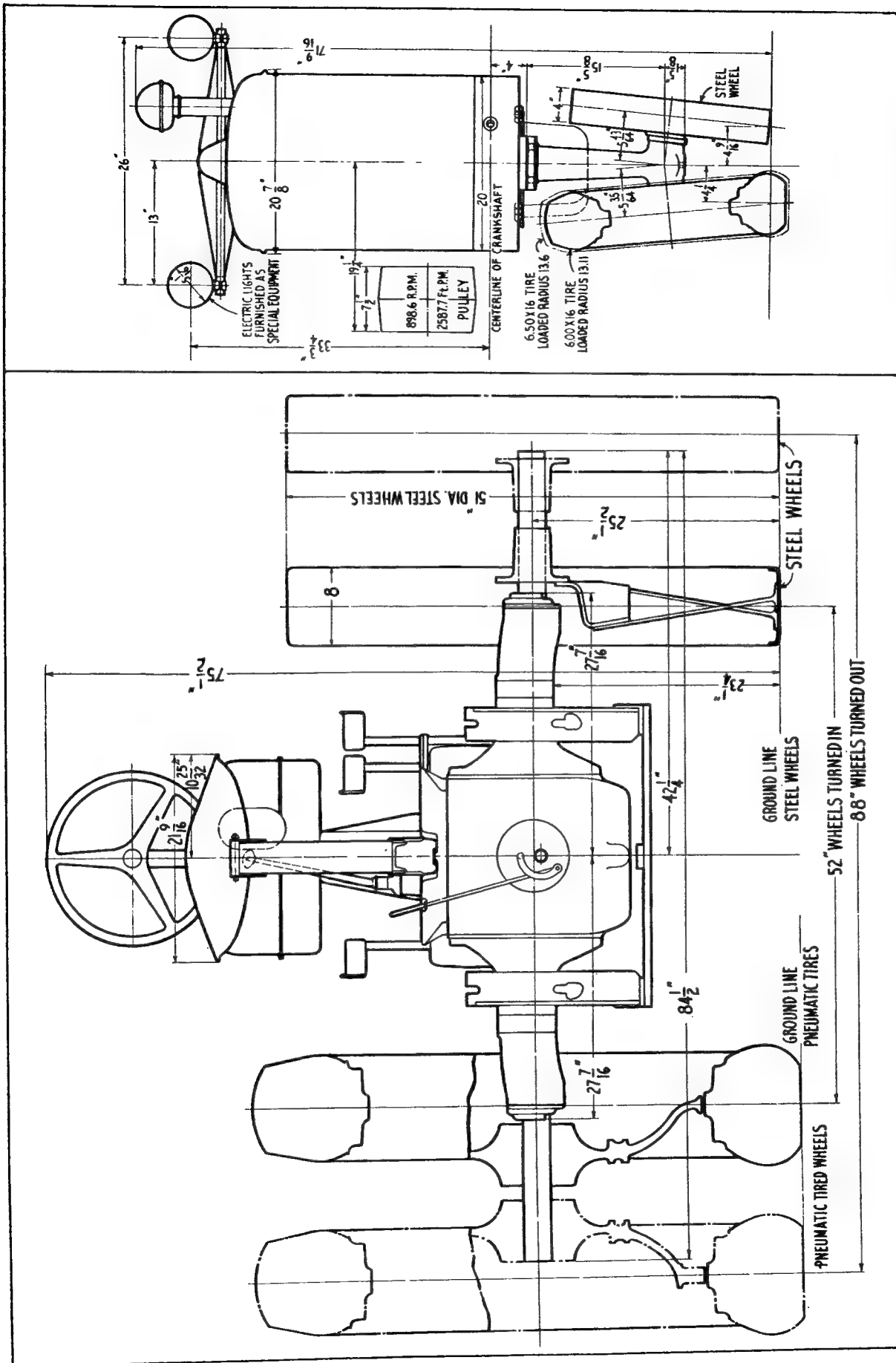
CARE OF CARBURETOR

The fuel screen should be cleaned occasionally. Fuel screen is removed by unscrewing fuel line fitting. Flange nuts which hold carburetor to manifold should be checked periodically for tightness.

NOTE: Periodically check the screws fastening the fuel bowl to fuel bowl cover and see that cover screws are kept tight to avoid any air lead past the fuel bowl cover gasket.

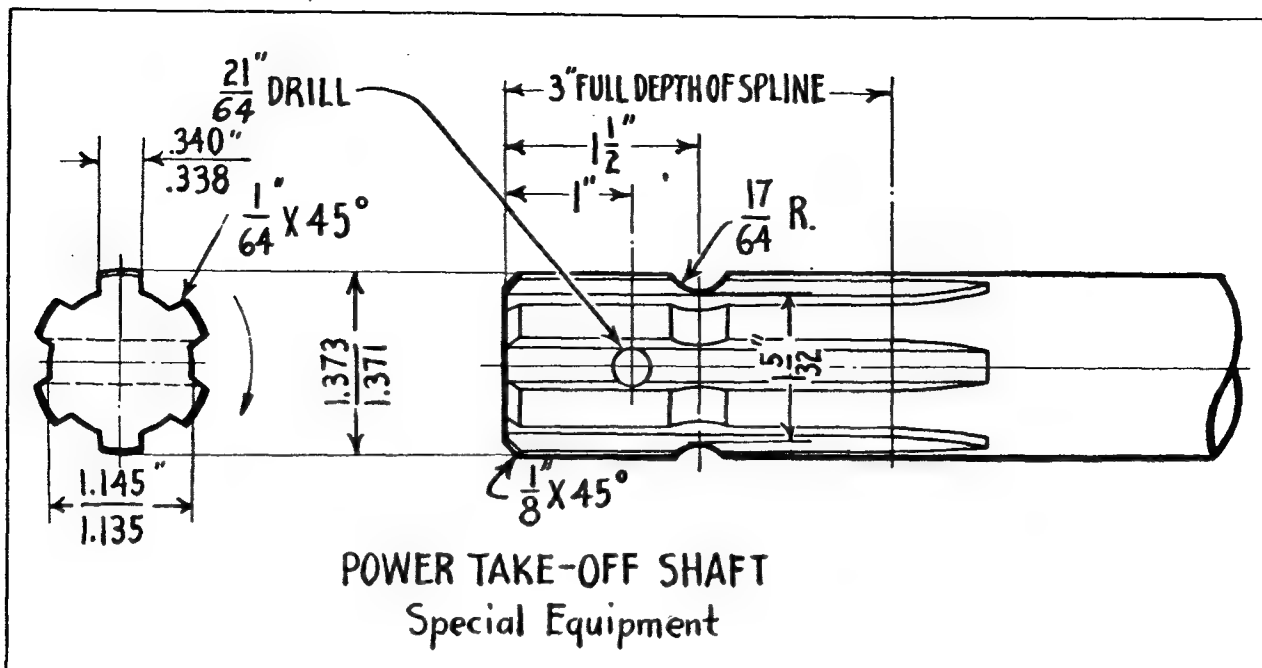


ILLUST. 24. SIDE VIEW OF FARMALL M SHOWING DIMENSIONAL DRAWING

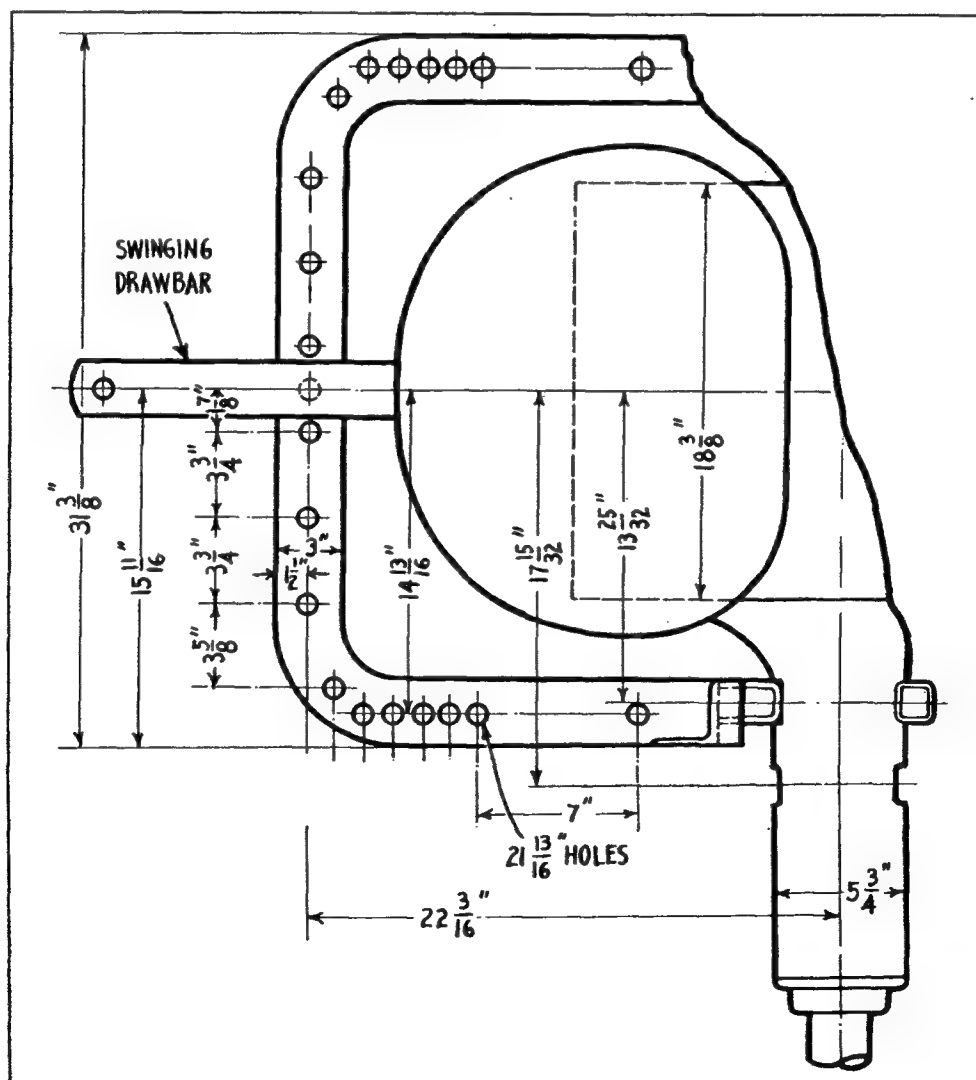


ILLUST. 26. FRONT VIEW
DIMENSIONAL DRAWING

ILLUST. 25. REAR VIEW DIMENSIONAL DRAWING



ILLUST. 27. POWER TAKE-OFF SHAFT DIMENSIONS



ILLUST. 28. DRAWBAR DIMENSIONS

MEMORANDUM

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